# Pit and Quarry

With which is consolidated CEMENT-MILL & QUARRY

Member Audit Bureau of Circulations

Read in Largest Number of Plants

Vol. XXII July 15, 1931 No. 8



Published bi-weekly on Wednesday for producers and manufacturers of Cement, Crushed Stone, Gypsum, Lime, Sand, Gravel and other non-metallic minerals. Entered as second-class matter October 9, 1928, at the Postoffice at Chicago, Ill., under the Act of March 3, 1879.



Copyright, 1931, by
COMPLETE SERVICE PUBLISHING CO.
538 South Clark St.
Chicago, Ill.



H. W. Baumgartner, *President*
V. E. Larsen, *Vice-President*
S. A. Phillips, *Directing Editor*
W. E. Trauffer, *Asst. Editor*
Harry F. Utley, *Asst. Editor*
Mat F. Beisber, *Asst. Editor*

*Editorial Field Representatives:*
A. C. Petersen
S. D. Smith
W. A. Renock

*Advertising Representatives:*
Chicago
W. A. Buschman L. C. Thaon
Telephone *Harrison 9357*
Chicago, Ill.

New York
E. M. Buck, 68-43 Clyde St.
Telephone *Boulevard 8-5259*
Forest Hills, L. I., N. Y.
A. W. Randle, 5 Prospect Ave.
Telephone *Vanderbilt 3-4801*
New York, N. Y.

Cleveland
W. E. Coates, 1258 Marlowe Ave.
Telephone *Lakewood 1166J*
Lakewood, Ohio



Subscription price: $5 for 3 years, $2 for 1 year in the United States and possessions, North, Central, and South America; elsewhere $1 additional for each year. Single copies 20 cents.


## *In This Issue*


*Editorials* ..... 14

*Doubles Capacity, Cuts Labor and Power Costs by Erecting New Plant* ..... 16

*New Crushing Facilities on Dredge Cut Costs and Improve Quality* ..... 22

*Steel Basket on Dredge Suction Nozzle Disposes of Oversize Stone* ..... 26

*Methods and Costs of Milling Feldspar at a North Carolina Plant* ..... 29

*Plants in Georgia and Florida Produce Lime Rock for Highway Use* ..... 39

*How Can We Stabilize Business if We Accept It at Any Price?* ..... 45

*Elevated Tracks Allow Rapid Unloading of Material to Concrete Plant* ..... 49

*The Development and Operations of the Canadian Asbestos Industry* ..... 51

*Men of the Industry* ..... 63
*Coming Events* ..... 64
*Pumpings from the Old Pit* ... 64
*Personal Mention* ..... 65
*Traffic News and Comment* ... 66
*Financial News* ..... 68
*Review of Foreign Practice* .... 69
*Recent Patents* ..... 70
*Manufacturers' Publications* .. 71
*Insurance Problems Discussed* 72
*New Machinery and Supplies* .. 73
*Legal Information* ..... 77


*Next Issue July 29, 1931*

# Pit and Quarry

With which is consolidated CEMENT-MILL & QUARRY

Member Audit Bureau of Circulations

Read in Largest Number of Plants

Vol. XXII July 15, 1931 No. 8



Published bi-weekly on Wednesday for producers and manufacturers of Cement, Crushed Stone, Gypsum, Lime, Sand, Gravel and other non-metallic minerals. Entered as second-class matter October 9, 1928, at the Postoffice at Chicago, Ill., under the Act of March 3, 1879.



Copyright, 1931, by
COMPLETE SERVICE PUBLISHING CO.
538 South Clark St.
Chicago, Ill.



H. W. Baumgartner, *President*
V. E. Larsen, *Vice-President*
S. A. Phillips, *Directing Editor*
W. E. Trauffer, *Asst. Editor*
Harry F. Utley, *Asst. Editor*
Mat F. Beisber, *Asst. Editor*

*Editorial Field Representatives:*
A. C. Petersen
S. D. Smith
W. A. Renock

*Advertising Representatives:*
Chicago
W. A. Buschman L. C. Thaon
Telephone *Harrison 9357*
Chicago, Ill.

New York
E. M. Buck, 68-43 Clyde St.
Telephone *Boulevard 8-5259*
Forest Hills, L. I., N. Y.
A. W. Randle, 5 Prospect Ave.
Telephone *Vanderbilt 3-4801*
New York, N. Y.

Cleveland
W. E. Coates, 1258 Marlowe Ave.
Telephone *Lakewood 1166J*
Lakewood, Ohio



Subscription price: $5 for 3 years, $2 for 1 year in the United States and possessions, North, Central, and South America; elsewhere $1 additional for each year. Single copies 20 cents.


## *In This Issue*


*Editorials* ..... 14

*Doubles Capacity, Cuts Labor and Power Costs by Erecting New Plant* ..... 16

*New Crushing Facilities on Dredge Cut Costs and Improve Quality* ..... 22

*Steel Basket on Dredge Suction Nozzle Disposes of Oversize Stone* ..... 26

*Methods and Costs of Milling Feldspar at a North Carolina Plant* ..... 29

*Plants in Georgia and Florida Produce Lime Rock for Highway Use* ..... 39

*How Can We Stabilize Business if We Accept It at Any Price?* ..... 45

*Elevated Tracks Allow Rapid Unloading of Material to Concrete Plant* ..... 49

*The Development and Operations of the Canadian Asbestos Industry* ..... 51

*Men of the Industry* ..... 63
*Coming Events* ..... 64
*Pumpings from the Old Pit* ... 64
*Personal Mention* ..... 65
*Traffic News and Comment* ... 66
*Financial News* ..... 68
*Review of Foreign Practice* .... 69
*Recent Patents* ..... 70
*Manufacturers' Publications* .. 71
*Insurance Problems Discussed* 72
*New Machinery and Supplies* .. 73
*Legal Information* ..... 77


*Next Issue July 29, 1931*

Pit and Quarry

Member Audit Bureau of Circulations

With which is consolidated CEMENT-MILL & QUARRY

Read in Largest Number of Plants

Vol. XXII CHICAGO, JULY 15, 1931 No. 8

## Cement Company Gets Stock-Selling Permit

### TO ERECT CALIFORNIA PLANT

Details of the organization and financing plans of the San Jose Cement Co., Ltd., have become available with the formal application of the company to the California Corporation Department to sell its stock. Authorized capital consists of 225,000 shares of prior preferred stock, 200,000 shares of participating preferred and 1,500,000 shares of common. All stock is $10 par, total capitalization, therefore, amounting to $19,250,000. Announcement of the incorporation appeared in a recent issue of PIT AND QUARRY.

The company has acquired and intends to buy more land near the station of Mercury, in Santa Clara County, near San Jose. This land has extensive deposits of limestone, plentiful water and is served by a branch line of the Southern Pacific. A modern cement plant will be constructed where it is planned to manufacture and market high-early-strength cement, it is reported. The plant will cost $2,250,000, it is claimed, with construction to start within 90 days. The Hunt-Mirk Co. of San Francisco will have charge of its construction.

Money from the sale of stock will be used to purchase machinery, construct the plant, and to provide working capital, according to the *Wall Street Journal*.

The California Corporation Department has given the company permission to sell all of its prior preferred stock—225,000 shares — and 225,000 shares of common stock, in units of one and one, at $10 a unit. Also to sell 170,000 shares of participating preferred and 85,000 shares of common stock, in units of two and one, at $20 a unit. Permission also was given the company to offer for sale any portion of its authorized units to manufacturers, contractors and others as consideration for machinery to be furnished the company.

Current land holdings consist of 1,179 acres about eight miles south of San Jose. The property is in three parcels but not widely separated, and acquisition of additional land is contemplated.

Water for the new plant will be received from Guadalupe Creek, and the plant will be built adjacent to the New Almaden branch of the Southern Pacific.

The board of directors of the new company consists of Ernest H. Dettner, Dr. Bruno Bruhn, Dr. Mark F. Hopkins, Vincent Gerdeau, Wendell C. Thomas, Irwin H. Rice, F. L. Burnell, Herbert L. Hatch and Thomas J. Benney.

Mr. Dettner is president and chairman of the executive committee, Dr. Bruhn is first vice president and consulting engineer, and Dr. Hopkins is second vice president and treasurer.

In its application to the corporation department the company said: "There are no other deposits of limestone of comparable quality and extent so conveniently located with reference to rail transportation and Northern California markets, and at the present time there are no cement plants on the Pacific Coast which are equipped as this company's plant will be for the manufacture of high-early-strength cement. The company plans to manufacture cement which is capable of passing all trade inspections in 24 to 48 hours after being poured."

## Marquette Gets Order for Government Cement

The Marquette Cement Manufacturing Co., Chicago, submitted the low bid for furnishing 240,000 bbl. of cement for concrete revetment operations in the Memphis district, according to the United States District Engineer's office at Memphis. The bid of the Marquette company was $1.30 per barrel f. o. b. government barges or freight cars at Cape Girardeau, Mo. Delivery is to be made at the rate of approximately 25,000 bbl. weekly and revetment operations are to begin some time this month.

## Starts Producing Gravel at Kingston Lake Plant

The new Kingston Lake sand-and-gravel plant of the Cast Stone Construction Co. of Bloomington, Ill., began operations late in June. Although not entirely completed—conveyors for barge loading and switch tracks are yet to be erected—washed and graded material is being stored for delivery later this month.

Two drag-lines are employed for excavating from the pit. Wash water is run into a pond and is re-used after clarification. Three sizes of gravel and sand are being produced.

## Important Producer in East Reorganizes

### O. M. GRAVES NEW PRESIDENT

At a special meeting of the board of directors of The General Crushed Stone Co., held at its main office in Easton, Pa., on June 30, the company was reorganized. The personnel under the new set-up is as follows:

Chairman of the board, John Rice; president, O. M. Graves; vice-presidents, H. H. Mitchell, in charge of finance; A. G. Seitz, in charge of operation; John Rice, Jr., in charge of sales; secretary and treasurer, Redington Moore; assistant secretary and treasurer, F. W. B. Pile; executive committee—John Rice, Chairman; H. H. Mitchell, O. M. Graves; board of directors—John Rice, H. H. Mitchell, O. M. Graves, W. L. Sporborg, A. G. Seitz, John Rice, Jr., Redington Moore.

F. S. Jones is general superintendent of Division No. 1 which includes the following plants: North LeRoy, N. Y., Akron, N. Y., Geneva, N. Y., Wilkes-Barre, Pa., White Haven, Pa., Rock Hill, Pa., Glen Mills, Pa., Port Deposit, Md., Winchester, Mass.

F. F. McLaughlin, general superintendent of Division No. 2, is in charge of the following plants: Little Falls, N. Y., Rock-Cut, N. Y., Auburn, N. Y., Watertown, N. Y., Ballina, N. Y., Lacona, N. Y., Palmer, N. Y.

Redington Moore is purchasing agent; B. P. Rex is bituminous sales engineer; and D. C. Hickey is chief engineer.

## Lime Plant to Be Built by Washington Concern

The Superior Lime & Mining Co., with temporary offices at the Cascadian Hotel, Wenatchee, Wash., will erect a lime plant on its limestone deposit located seven miles up the Entiat River from Wenatchee, according to reports. Plans for a plant costing about $150,000 are being drawn by Barker & Hill, consulting engineers of Seattle, Wash. Orders are said to be on hand for 20,000 tons of lime annually for the next five years, provided the plant is ready for production by the first of the year. Officers are George C. Jones, president, and J. C. Bolinger, secretary.

## Warner Co. Affiliate Builds Hydrate Plant

### DUST COLLECTORS INSTALLED

A number of changes have been made recently at the Bellefonte, Pa., lime plant of the American Lime & Stone Co., a subsidiary of the Warner Co., Philadelphia.

A new hydrate plant, which will more than double production, a complete dust-collecting system, and an improved drying plant are included in the improvements.

The new hydrate plant is a steel structure 50-ft. high and was built around the old plant so that operations could continue without interference during construction.

A Northern Blower Co. dust collector was installed in the spring of this year and is now operating satisfactorily.

Because of the demand for special sizes of pebble lime, another screen has been installed. A change in the system for obtaining heat for preliminary drying of stone has also been made. In the past, whenever No. 1 of the two kilns was shut down for any reason, it became necessary to heat the drier with gas purchased from the Central Pennsylvania Gas Co., since the drier obtained heat normally from the stack of No. 1 kiln. The company has now completed the construction of a flue connecting the drier with the No. 2 kiln stack so that, no matter which of the two kilns is operating, heat is always available for drying purposes.

## General Mica Co. Plans to Lease Railroad Line

The Interstate Commerce Commission has conditionally authorized the Denver & Rio Grande Western R. R. to abandon 16½ miles of narrow-gauge branch line extending from Taos Junction to La Madera, New Mexico.

A condition imposed provides that road shall lease the branch line to anyone desiring to take it over for continued operation. This provision was made in order to give the General Mica Co. opportunity to lease the road and operate it to serve its mines.

## Gets Permit to Dredge Tennessee River Gravel

Ohio River Sand & Gravel Co., Parkersburg, W. Va., has secured permission to dredge sand and gravel from the Tennessee River near Eva, Tenn. A loading plant will be constructed on recently acquired waterfront property.

## Chicago Area Producers of Gravel Consolidate

A number of sand-and-gravel producers in the Chicago metropolitan area, including the Pyott Sand & Gravel Co.; A. Y. Reed Sand & Gravel Co.; Beloit Sand & Gravel Co.; Tiffany Sand & Gravel Co.; South Elgin Sand & Gravel Co.; Northern Illinois Supply Co.; Tractor City Sand & Gravel Co.; Waukesha Lime & Stone Co.; Security Sand & Gravel Co.; and the Producers Sand & Gravel Co., have recently consolidated. The new company will be known as the Union Sand & Gravel Co., with offices at 228 No. LaSalle St., Chicago.

J. E. Lindquist is chairman of the board and Chas. Jacobs is president of the new company.

## Muehlke Made Director of International Cement

At the annual meeting of the International Cement Corp. held recently R. W. Atkins resigned as a director and was succeeded by H. H. Muehlke, secretary and treasurer of the company. Other retiring directors were reëlected.

## New Crushed-Stone Plant Near San Fernando, Cal.

The Aetna Clay & Rock Products, Inc., is erecting a crushed-stone plant in Little Tujuanga Canyon near San Fernando, Cal., and was to have started operations on June 15. Development of a deposit of feldspar is also contemplated. Officers of the company are H. R. Taylor, Sr., president and general manager, and I. C. Hanson, secretary.

## California Aggregates Plant Damaged by Fire

Fire of unknown origin broke out recently in the Campbell, Cal., plant of the Pacific Coast Aggregates Co., destroying several thousand dollars' worth of buildings and equipment. An exact estimate of the damage was not available.

## Florida Lime Operator Rebuilds Hydrate Plant

The Florida Lime Co., Inc., is rebuilding its hydrated-lime plant at Ocala, Fla. The plant was badly damaged by fire some time ago. New hydrators, air separators and dust-collecting equipment are being installed.

## Abrams Establishes Own Laboratory in New York

Duff A. Abrams, former director of research for the Portland Cement Assn., and more recently in charge of research work for the International Cement Corp., has established his own laboratory in New York.

Mr. Abrams is best known for his studies in developing the water-cement-ratio law.

## All Universal-Atlas Plants Safe in June

### NO MISHAPS IN NINE MILLS

While toy cannons and fire crackers were exacting their annual accident toll on July 4, workers of the Universal Atlas Cement Co., a subsidiary of the United States Steel Corp., were celebrating a new safety record just made when all nine of the company's plants went through the month of June without a single lost-time accident. Although individual plants have gone for periods of several years without an accident in the past, this is the first time that all of the company's plants, quarries and connecting railroads have gone for one month without a lost-time accident, according to B. F. Affleck, president.

"It is particularly gratifying to know that this record was made during June when cement plants throughout the country were conducting an accident prevention campaign, sponsored by the Portland Cement association," Mr. Affleck said.

"At the beginning of the month we held safety meetings at all of our plants and raised safety flags to be kept flying until brought down by a lost-time accident. Thanks to the cooperation of all the workers, June 30 found the flags flying at every plant."

The accident-prevention work of the Universal Atlas Co. is in charge of Gordon C. Huth, safety director. Committees are appointed in each plant to inspect equipment, investigate all accidents or near accidents and report on causes and recommendations for preventive measures.

Among the company's plants which have established especially good safety records are the Hudson, N. Y., plant which has had no accident for 13 months since May 27, 1930; the Leeds, Ala., plant which has had no lost-time mishaps since December 17; the Northampton, Pa., plant, one of the country's largest mills, which has had no lost-time accident since December 23; the Pittsburgh plant which went without an accident from September 3, 1929, to May 6, 1931; and the Independence, Kan., plant which has had no accident since December 30. Recently the Pittsburgh plant celebrated the awarding of the Joseph A. Holmes safety association certificate of honor and the dedication of the Portland Cement Assn. safety trophy.

## Erects Aggregates Dock on Ashtabula Frontage

Kelley Island Lime & Transport Co., Cleveland, O., recently announced the establishment of a new dock at Ashtabula, O. Modern sand- and- stone-handling machinery will be installed. T. Jensen will be in charge of operations.

## Basic Products and Dolomite in Merger

**RETAIN FORMER MANAGEMENT**

Dolomite, Inc., of Cleveland, O., operating a crushed-stone plant at Maple Grove, O., and Basic Products Co., of Pittsburgh, Pa., operating two crushed-dolomite plants near Tiffin, O., have been consolidated under the name of Basic Dolomite, Inc.

The Dolomite management is retained in the new company, with Howard P. Eells, president, and Dan. P. Eells, both of Cleveland, chairman of the executive committee. George Davison, Allen S. Davison and Albert P. Meyer, Basic company officials, are chairman of the board, vice-president and member of the executive committee, respectively.

Basic Products Co. operates two cement plants, one at Neville Island, Pa., the other at Kenova, W. Va. The cement division has changed its corporate name to the Green Bag Cement Co. of West Virginia, after the trade name of its product, "Green Bag" Portland cement.

## St. Joseph Quarries Co. to Open Crushing Plant

St. Joseph Quarries Co., of St. Joseph, Mo., developing a plant and quarry for crushed stone, is installing $50,000 machinery from its Savannah quarry. The plant is to have a capacity of 12 carloads of 50 tons each every 10 hours.

## Thunder Bay Co. Awards Contract for New Dock

Contract has been let by the Thunder Bay Quarries Co., Alpena, Mich., to W. J. Meagher Co., Bay City, Mich., for a new pier and loading dock on Thunder Bay, to cost over $85,000. Mechanical-loading and other material-handling equipment will be installed.

## Famous English Granite Quarry Sold at Auction

The once famous quarry which furnished the granite used in constructing the London Bridge, House of Parliament, Bell Rock lighthouse, Covent Garden Market and many other famous buildings, went under the hammer recently with the sale at auction of the estate of Cairngall, near Aberdeen, Scotland.

## Demand Forces Producer to Operate Night Shift

The Central Rock & Sand Co. of Kingsport, Tenn., began night operations under flood lights recently in order to keep the production of its quarry up to demand. This is the first time in the history of the company that night operation has been necessary.

H. C. Brooks, president of the Central Rock & Sand Co., is optimistic over business conditions and declares that he expects a general pickup in the building trades during the summer. The sand and gravel business of the company is running at full capacity but without a night shift, according to Mr. Brooks. The company recently installed new electric-motor equipment and other machinery in order to secure a greater production at its plant.

## Michigan Stone Producer Begins Water Shipments

The initial shipment of crushed stone by water from the quarries of the Wallace Stone Co. of Bay Port, Mich., has been started by the Bay Port Transportation Co., a subsidiary of the stone company.

Railroad tracks 13,000 feet in length were laid from the quarries to the shore where bins with a capacity of 2,500 tons were erected last winter.

A channel 12 ft. deep and 80 ft. wide was dredged from the shore into the bay for a distance of about two miles. A wharf was not required as the channel runs to the shore. Stone is brought by locomotive and cars from the quarry to the bins and belt conveyors load the stone from the bins into an all-steel barge.

Water-transportation facilities include a 146-ft. steel barge, the *Huron*, and a 102-ft. steam tug, *Bay Port*.

The maiden trip of the tug and scow was made recently from Bay Port to Saginaw with the scow carrying a load of 600 tons. The capacity of the tug is 1,000 tons.

## Acquires Glass Plants and Glass-Sand Deposits

Libbey-Owens-Ford Glass Co., Toledo, O., manufacturer of sheet glass products, has arranged for the purchase of the plants of the National Plate Glass Co., Ottawa, Ill., a subsidiary of General Motors Corp. A price of about $9,000,000 was given for National plants, including a tract of glass-sand deposits, which will be developed by the new owner. In connection with purchase, General Motors Corp. has placed a seven-year contract with Libbey-Owens-Ford Co. for shatterproof glass requirements for all lines of automobiles under its direction, the award totaling over $45,000,000 for the period.

## Fire Damages Buildings at Montreal Stone Plant

Dominion Rock, Limited, of Montreal, Que., Can., a subsidiary of the Montreal Quarry Co., Ltd., suffered an estimated loss of $25,000 when the plant, located on Cote St. Michel Rd. near Montreal, was partially destroyed by fire recently. The unit housing the crushing machinery was burned to the ground.

## Lime and $CO_2$ Plant Planned for Nevada

**PROJECT WILL COST $40,000**

M. C. Klosky of Carson City, Nev., is seeking a site for a "dry-ice" and lime plant somewhere east of Reno, Nev., along the tracks of the Southern Pacific Railroad. F. H. Sibley of the engineering department of the University of Nevada has completed estimates which call for the expenditure of approximately $40,000 for the plant.

The proposed plant would obtain raw material from limestone deposits in the Pine Nut range of mountains about five miles south-east of Carson City, where rail transportation is available. It is estimated that approximately 750,000 tons of the material lie above the surface without overburden but no estimate has been made of the total available supply.

Those interested in the new enterprise propose to reverse the usual procedure and make lime a by-product to the manufacture of "dry ice." It is stated that shale is present on the property in sufficient quantity to make the manufacture of cement profitable, but for the present, it has been determined that operations will be concentrated on the production of solid carbon dioxide.

An operating organization is now being formed for the purpose of developing the limestone deposit near Carson City. The company is to be financed by Carson City and Reno capital and operations are to be in charge of M. C. Klosky as general manager, according to W. B. McCreary, of the Western Securities Co. of Reno.

## Gypsum Quarry Reöpened by Nova Scotia Operator

The Nova Scotia Coal & Gypsum Co. has reopened its gypsum quarry, at Cape Breton, N. S. It is planned to quarry sufficient raw gypsum to fill the company's storage building, located at Mabou Harbor. About 20 men are employed at the Cape Breton quarry.

## Ordinance Would Provide for Fencing Gravel Pits

The city council of Minot, N. D., has under consideration an ordinance to regulate the hazards of open gravel pits and ponds within the city limits. It provides that pits must be enclosed with a woven-wire fence five feet high, or by some equally efficient barrier.

## To Open Crushed-Stone Quarry near Sioux City

Bilhorn, Bowers & Peters of St. Louis, Mo., are planning to open a crushed-stone quarry near Sioux City, Ia., as a source for stone to be used in constructing dikes in the Missouri River.

# Editorials

## *Why Not Raise Prices Now?*

WE are in favor of raising prices and we have so expressed ourselves. It is our belief—and we think there is an abundance of evidence to support the contention—that the widespread lowering of prices characteristic of business during the last year has done nothing to increase the sale of commodities. We know that there are some men who will say lower prices have prevented sales from declining more than they have already declined, but their plea is about as logical as that of the reformer who told the dying octogenarian tobacco user that he might have lived to be a hundred years old if he had abstained from smoking. There is no evidence in support of either assertion.

In our opinion, a flat increase of 10 per cent. in commodity prices—not above the abnormally low figures at which commodities are too frequently offered, but above present lists—would do much to stimulate buying. It would have the immediate effect of suggesting to the prospective buyer that, possibly, the bottom, which he has so long awaited, had at last arrived and that prudence would advise the purchase of needed commodities before prices should rise still farther. It would encourage the buying of other commodities not so badly needed; it would stimulate interest in plant improvement and other additions to invested capital; it would supply the increased consumer demand for which capital and labor are so anxiously waiting.

We should concern ourselves more with the commodity price level than with unemployment and the stock market, said John Maynard Keynes, the British economist, in a recent address. He recognizes, as clearly as other thinking men, that profits are impossible when prices are demoralized, that sales decrease rather than grow on a falling market, and that unemployment will correct itself if consumer demand can be stimulated. He cites the building industry as one in which costs have not declined and he holds it to be dangerous to lower costs (prices) to the point where the value of existing properties would be reduced through the erection of new competitive buildings built at lower costs. In his opinion, the maintenance of building costs at their present high levels practically insures the security of capital invested in existing structures erected at peak prices. He is opposed to deflation, believing that it would disarrange not only real estate but farm mortgages and national debts too.

The cutting of wages in order to reduce prices, aside from its dangers by threatening social disorder, would increase proportionately the burden of monetary indebtedness, says Prof. Keynes, and this is already so heavy that any material addition to it would render it intolerable. And, yet, if wages are to be maintained, as we have pointed out before, prices must certainly be maintained at their old levels and this means, as we all know, that they must be raised from their present small-profit or below-profit levels. Further reduction in prices could easily bring about a situation even more disastrous than the existing state of affairs. The questions of price reduction and price maintenance have emerged from the realm of individual right and private conscience; they are matters of public concern. Price reductions, such as we have seen in almost every line of industry, are inimical to profitable business in any line because their effects spread throughout all industry, infecting every type of buyer with the fear of buying now and the desire to wait for further price concessions and withholding from capital and labor the consumption of goods which is essential to the stability of both.

There will be no business recovery until the public begins to buy at an increased rate. And there will be no increase in consumer demand until prices are strengthened and begin to rise.

## *"To Meet Motor Competition"*

RECENT months have supplied many instances of the wholesome effect on freight rates of the competition offered to the railroads by motor-truck and other competition. Scarcely a day passes without witnessing one of more proposals to lower freight rates in order to bring them into competition with those quoted by highway-transport lines. Nearly every issue of PIT AND QUARRY furnishes, in the department devoted to traffic matters, new evidence of the advantages that accrue to shippers through the growing use of motor trucks. Wherever motors, whether privately-owned or operated by public carriers, have threatened the position of the railroads, the latter have been quick to propose reductions in the prevailing freight rates, either because traffic has already been diverted to motor trucks or because such a diversion appears imminent.

Reductions of 10, 15 and 20 cents a ton are very common, while savings of larger amounts, ranging up to 40 and 50 cents a ton, are not unusual. In some territories the reductions have been nearly as great as 50 per cent., as in the case of a recent reduction in the rate on crushed stone which was marked down from 90 to 50 cents, and in one instance within the last two months the rate on sand and gravel has been reduced from $1.90 to 85 cents a ton. The greatest reductions are made, naturally, in those cases where motor trucks offer the greatest competition, that is to say, on relatively short hauls up to, say, 200 miles, although there have been some notable instances where sharp reductions have been made on hauls generally considered beyond the radius of profitable truck operation.

Many producers, through the purchase and op-

eration of motor trucks, have shown a determination to achieve the maximum economy possible by eliminating the profit of the motor carrier. Others, still unconvinced of the economy of motor transport or unable to take advantage of it because of insufficient tonnage going by motor truck, utilize the public motor carrier and pay his profit rather than assume the risks of investment. In either case, they are depending more and more on the speed, flexibility and dependability of motor haulage and are reaping the benefits, not only through the economies of direct shipment, but also through the reductions affecting materials moved by rail.

Since the railroads have felt the sting of motor competition they have shown a much more conciliatory attitude toward the shipper, and this is strikingly displayed in their willingness to place rates on a basis that recognizes the cost and economies of other forms of haulage. This is a healthy state of affairs for the railroads as well as the shippers, for it forces them to a fresh consideration of the ways in which their service can be improved and its costs reduced. The shipper who is still unversed in the economies of motor transportation should investigate its possibilities immediately, even though he may be the gainer through present freight-rate reductions that result from the competition offered by other motor-truck owners. Such an investigation is likely to introduce him to an entirely new conception of delivery costs at the same time that it is certain to make him more independent of the delays and somewhat arbitrary rate structure of the railways. The present is an exceptionally favorable time for attaining these advantages at reasonable cost and with an unusually high degree of certainty of the outcome.

## *The Season for Holidays*

MORE than one type of holiday seems to be in order these days. Whereas one normally thinks of the vacation holiday, the pleasurable holiday, as the holiday of the summer period, President Hoover has shown us another kind through his suggestion of a moratorium among the nations financially obligated to one another. We can think of any number of useful holidays which might be inaugurated at this time and, while we do not offer the following suggestions with the expectation that they will gain attention or arouse enthusiasm comparable to the attention and enthusiasm so appropriately given to the moratorium plan, we are sufficiently optimistic —or, shall we say, simple—to feel that some of them could be made productive, within their limited spheres, of equally salutary results. Being, as the quack psychologists would term us, "holiday-minded," we are courageous enough to suggest the following holidays, each to begin at once and each to run for at least one year:

1. A holiday for the stock exchange. If all the time devoted by business men and the public generally to a discussion of paper-profit losses and the chances of making a living without working for it were devoted to selling, intelligent production, and the buying of needed commodities, business might compare favorably with that of any good year.

2. A holiday for the price cutter. If producers gave as much thought to reducing the cost of production, through the introduction of the most modern and efficient machinery, as they do to reducing the price of their products, through the adoption of every tricky device they can conceive for cutting prices under fancy names, fewer dividends would be passed.

3. A holiday for the profit-destroyer. If the producer who gives away his sand in order to get an order for gravel, or emerges from his transactions owing the railroads money, or finds that he has killed a competitor but wrecked his own business, could be forced to spend his time in idleness, business would show immediate signs of mending.

4. A holiday for the expansionist. If every advocate of the building of a new plant or the enlargement of an existing one were to be suddenly afflicted with temporary aphasia, conservative business men would have a better chance of adjusting production facilities to consumer demand.

5. A holiday for the pessimist. If the misinformed wiseacres, who spread the gospel of business depression long before the country actually experienced it, could be placed in solitary confinement, sanity would soon return to those who, by repeating their silly predictions, brought themselves and millions of others to a state of mental torpor.

6. A holiday for the business historian. If all the statistically-minded business men, who insist on judging this year's business by that of last year and this month's by last month's, should lose their records, we might take a sane view of the future instead of a silly one of the past.

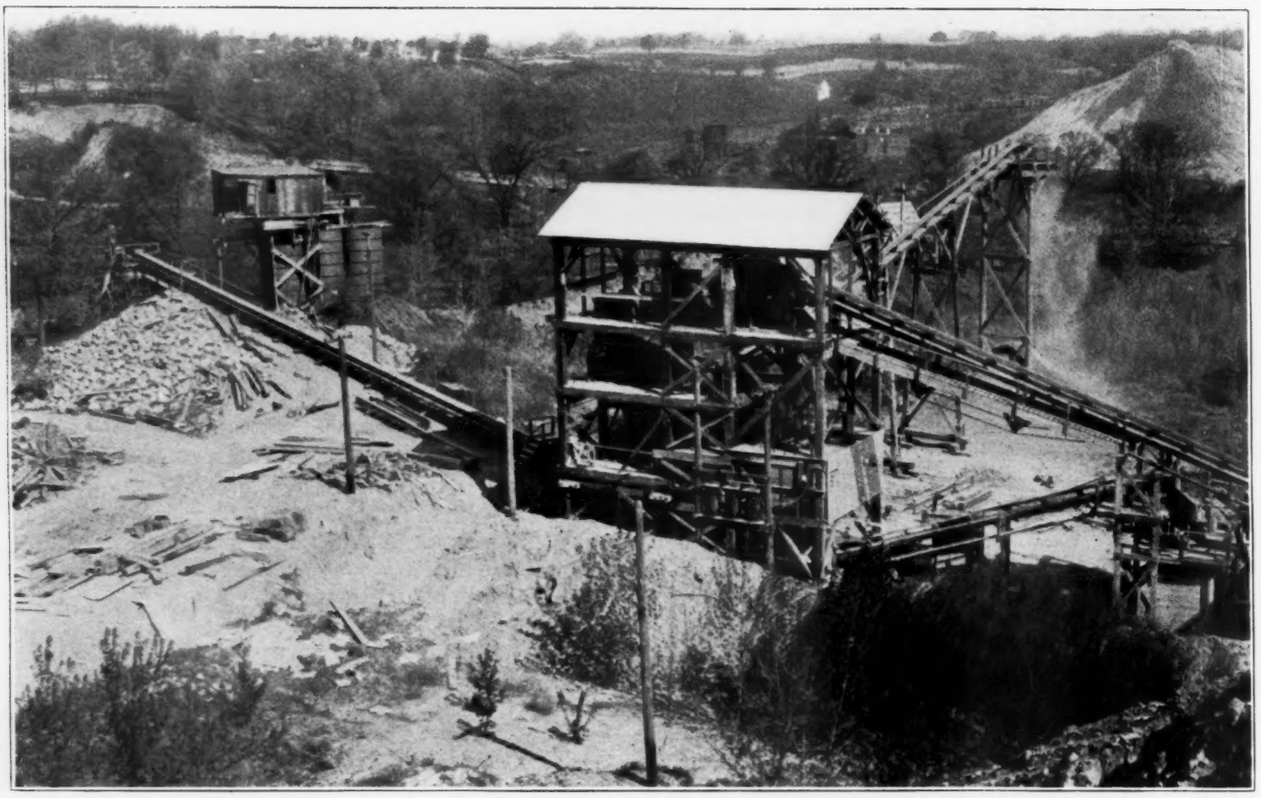
7. A holiday for government. If the Federal Trade Commission and the Attorney General's office could be induced to devote themselves to the preservation of a state of free competition between the wild animals of our northern woods, where the law of the survival of the fittest levies its toll without the interposition of man-made restraints, business men would be greatly encouraged to remedy their own abuses simply and expeditiously.

8. A holiday for the false prophet. If all our soothsayers, who assure us that business is just around the corner but neglect to say which corner, could be temporarily anesthetized, we should all realize that business is right at hand for any man who will plan and work intelligently to get it.

9. A holiday for the medicine man. If all the purveyors of quack remedies for our present troubles could be transported for treatment to the German spas, it might occur to us that business depression is the result of mental depression and that its control, therefore, is in our own hands.

10. A holiday for the fearful. If the timid and faint of heart could be removed from our midst, courage and the will to do would reassert themselves as qualities capable of the same accomplishments as of old.

Most of us fall within at least one of these classes; many of us belong in all. By either test, a vast multitude is, in our opinion, due for a long holiday of rest.



General plant view. Loading conveyor at left; stock-piling conveyor in background.

# Doubles Capacity, Cuts Labor and Power Costs by Erecting New Plant

## Illinois Operator Finds Modern Equipment Produces Gravel at One-Third Former Cost

THE Western Sand & Gravel Co., for many years one of the leading producers of road gravel in the Middle West, recently put into operation a new plant near Spring Valley, Ill., which is second to none in design, in the high grade of equipment used, and in the high quality of its product. This plant replaces an old plant, operated by this company on the same location, which was described in the Nov. 21, 1928, issue of PIT AND QUARRY. The product is a secondary-road material coated with clay which serves as a binder.

The new plant is of concrete and timber construction and is partially inclosed with corrugated-metal siding. Later all buildings will be fully inclosed. Vibrating screens are used for all sizing and belt conveyors for all movement of material except from the pit to the plant. The plant was designed for a capacity of 250 tons per hour. At present a capacity of 225 tons per hour is being handled without trouble with one locomotive. If the demand justifies, another locomotive will be added later which will increase this capacity materially.

An interesting comparison which well illustrates the efficiency of the modern plant can be made by comparing the old plant with the new. The old plant, which was as good as the average gravel plant, had a capacity of 125 tons per hour, which it attained with a force of 10 men, and had a power load of 200 hp. The new plant, with a 100-per cent. greater capacity, requires the services of only 7 men, and, while its motors are rated at 200 hp., actually uses much less power.

The company owns 106 acres of gravel-bearing property, all of which has been test-holed to an average depth of 55 ft. In places, however, the deposit is 70 ft. deep. When the new plant was put into operation the old pit north of the plant was temporarily abandoned as it was too great a distance from the plant. A new pit was opened northwest from the plant toward the nearby state highway. This will be enlarged until it connects with the old pit when the track will be laid parallel to the face. The pit now has a face of 42 ft. which will become higher as the pit is enlarged. There is very little overburden and the gravel runs 40 per cent. over 1¼ in. and 65 per cent. over ¼ in. in size.

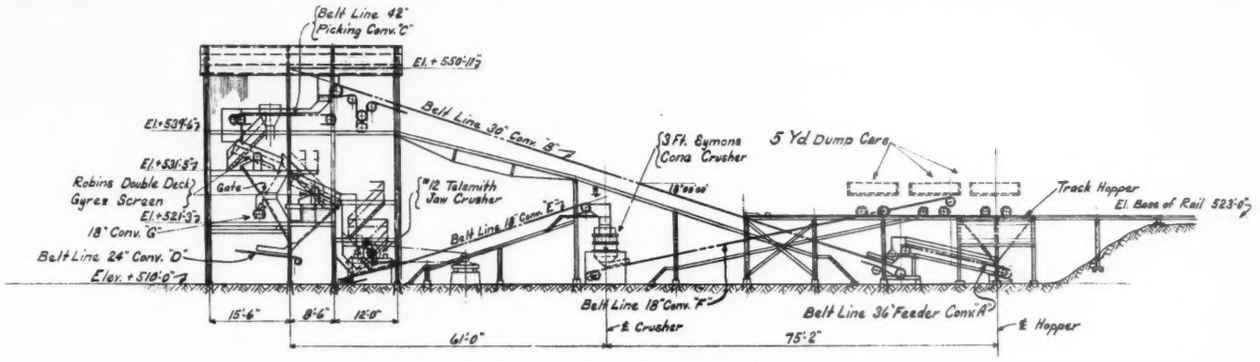
The clay content varies from 2 to 4½ per cent., sufficient for binding purposes. Sometimes boulders are encountered weighing from 500 to 600 lb. These are rejected by the grizzly at the plant hopper.

In the pit a Marion Type 7 electric shovel with a 1¼-cu.yd. dipper loads into 5-cu.yd. capacity side-dump cars rebuilt by the Equipment Corp. of America. These are hauled a distance of about 600 ft. to the plant in a train of two cars by an 8-ton Whitcomb locomotive powered by a 4-cyl. Climax gasoline engine. The track is 36-in. gauge. The locomotive is refueled by a standard gasoline pump from a 225-gal. capacity underground steel tank alongside the track at the edge of the pit.

The cars are hauled along a fill and wooden trestle to a point where they are dumped into a 15-cu.yd.-capacity steel-lined timber hopper. A 12-in. bar grizzly over the hopper rejects all boulders too large for the crushers. The hopper discharges through a sliding gate onto a 36-in. by 19-ft. belt feeder. The hopper is designed so that the material does not fall directly onto the feeder. This feeder in turn discharges to the main 30-in. by 114-ft.

Locomotive and cars at the track hopper.

The main conveyor discharges over a 4-in. sloping bar grizzly onto a picking conveyor. Here any clay balls present in the gravel are picked out and dropped into a wooden chute which discharges to a pile alongside the plant. The purpose of the grizzly is merely to allow the fine gravel to drop onto the conveyor first, thus providing a cushion for the large material coming over the grizzly. This




Diagrammatic cross-section of the Western Sand & Gravel Co. plant.

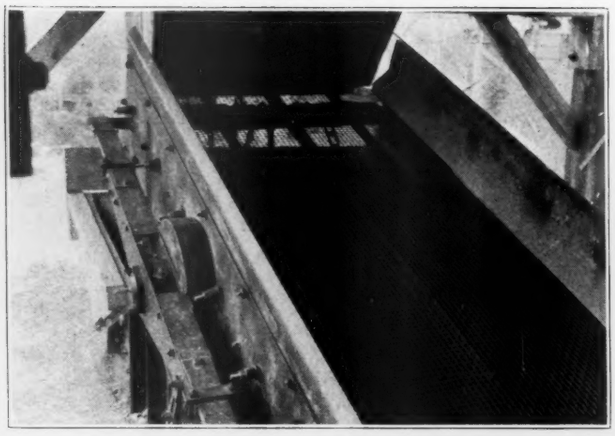
centers inclined belt conveyor at the screening plant. The belt conveyor is driven at its head pulley by a 20-hp. General Electric motor through a Jones herringbone speed reducer. A new type of roller hold-back, recently developed by the W. A. Jones Foundry & Machine Co., is used to prevent reversing of the belt under load in case of power failure. It is a compact unit and fastens to the high-speed shaft of the speed reducer. The feeder is chain-driven from the tail pulley of the main conveyor.

Shovel loading dump cars in the pit.

arrangement is expected to materially lengthen the life of the conveyor belting. The picking conveyor is 42-in. wide and on 17-ft. 6-in. centers and is chain-driven from the head shaft of the main conveyor.

The picking conveyor discharges through a chute with a stone box onto a Robins Gyrex 5-ft. by 10-ft. double-deck vibrating screen. This has ¾-in. screen cloth on the top deck and ¼-in. cloth on the bottom deck. All of the material from the pit goes over this screen and the stone box breaks the force of impact of the large stone on the screen. This screen is driven by a 7½-hp. General Electric motor through a Jones V-belt drive. Baffles in the chute at the discharge end of the screen break the force of the large stones passing to the second screen.

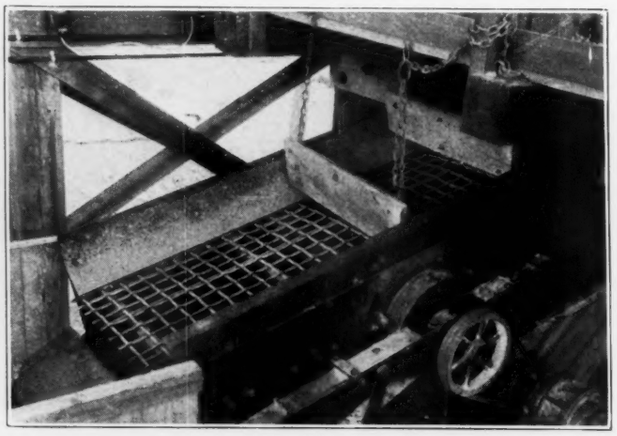
The fine material passing through the bottom deck of the screen discharges through a chute onto a stock-piling conveyor. A flopper gate in this chute permits the diversion of any desired proportion of fines onto the loading conveyor with the finished road gravel to suit the requirements of the road contractors. The material retained on the bottom deck discharges through a chute to the conveyor to the car-loading building. The oversize dis-



Vibrating screen used for preliminary separation.

charges onto a second Robins Gyrex screen. This is a 4-ft. by 8½-ft. double-deck unit with 3½-in. mesh cloth on the top deck and ¾-in. on the bottom deck and is driven by a 5-hp. General Electric motor through a Jones V-belt drive. The bottom deck of this screen is changed when a different size is desired.

The material passing through the lower deck goes to a conveyor to the loading plant. This conveyor receives its material from three different sources. The oversize discharges through a 2-cu.yd.-capacity surge bin with a sliding counterweighted vertical gate into a Telsmith 11-in. by 22-in. jaw crusher. Ordinarily the feed to the jaw crusher is continuous but sometimes an excess of coarse material comes from the pit which must be kept from flooding the crusher. The ¾-in. to 3½-in. material retained on the bottom deck by-passes the jaw crusher onto an 18-in. inclined belt conveyor on 47-ft. 10-in. centers which feeds this material and the product of the jaw crusher to a Symons 3-ft. cone crusher for further reduction. This crusher discharges onto an



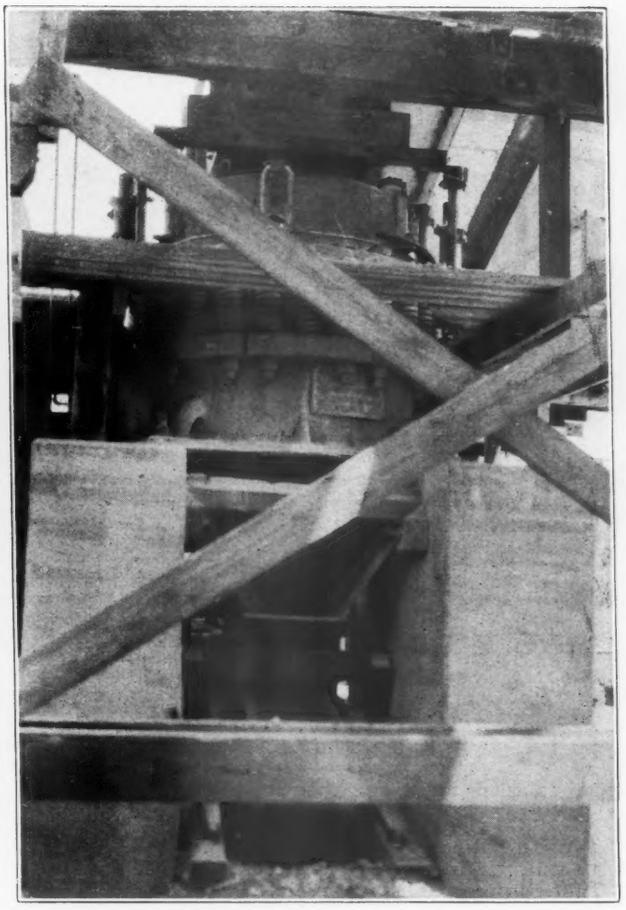
The vibrating screen used for final separation.

18-in. by 70-ft. centers inclined return conveyor which discharges into a small hopper in the corner of the track hopper. Both feed onto the same belt feeder to the main belt, sliding gates under each hopper allowing a consistent mixing of the crushed gravel with the pit-run material. These gates are controlled from the track-hopper platform by the man who dumps the cars. This system of mixing allows the crushed gravel to also acquire a coating of the clay which makes it so valuable as road gravel.

The jaw crusher is belt-driven by a 50-hp. General Electric motor; the Symons crusher is Texrope-driven by a 75-hp. Fairbanks-Morse motor; the crusher return conveyor is driven by a 5-hp.

Shovel loading cars at new pit. Old deposit at the right.

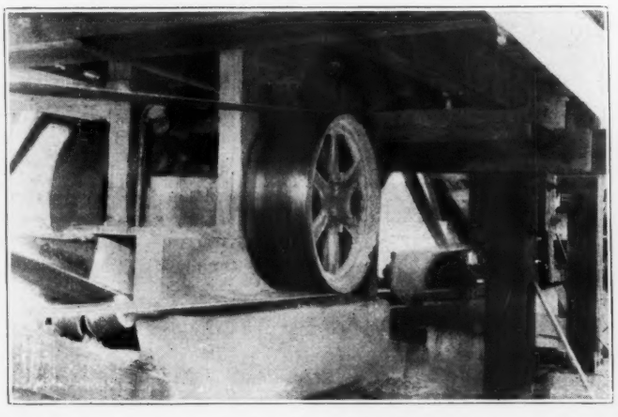
This stock-piling conveyor carries material under ¼-in.



Cone crusher used for secondary reduction.

Westinghouse motor through a Jones speed reducer; and the hopper return conveyor is driven by a 5-hp. Crocker-Wheeler motor through a Jones speed reducer.

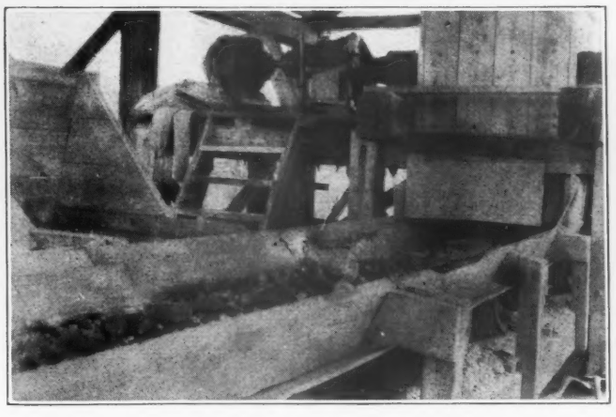
The stock-piling conveyor previously mentioned is 18 in. wide and operates on 100-ft. centers and is driven at its tail pulley through a Jones speed re-



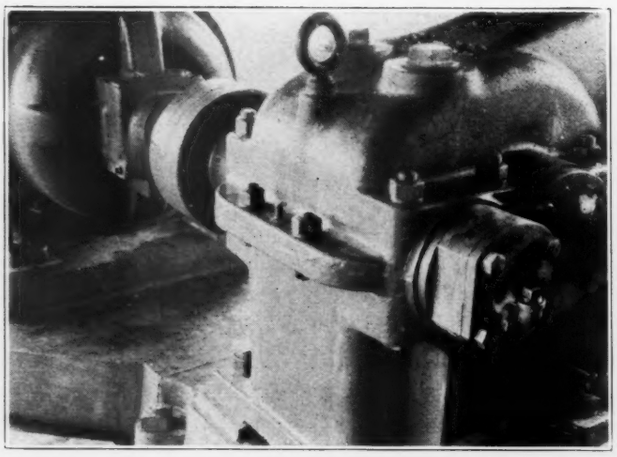
Primary jaw crusher. Tail pulley of loading conveyor at right.

ducer by a 5-hp. General Electric motor. This system has a stock-pile capacity of about 5,000 tons. As this material is all below ¼-in. in size and has a coating of clay, it will be sold for resurfacing old stone and gravel roads. Some means of recovering this material onto the loading belt conveyor will be installed later. A drag scraper will probably be used for this purpose.

The loading conveyor is 24 in. wide and on 218-ft. 9-in. centers and operates at a slope of about 3½ deg. It is driven at its head pulley by a 15-hp. General Electric motor through a Jones reducer. The conveyor is on a timber trestle with its discharge end at the point where the old plant was located. The conveyor discharges the material through a split chute with flopper-gate control to either of two steel-lined timber loading spouts. At present material is loaded only on one track. This track



Picking conveyor and drive. Chute for clay balls at left.



Speed reducer on main conveyor. Note automatic stop on high-speed shaft.

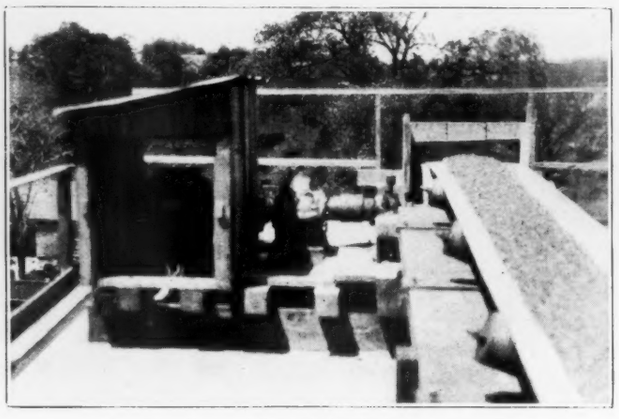
has a capacity of 38 empty and the same number of loaded cars. All car movements are by gravity and train service four times each day insures against car shortage. A second loading track and two additional storage tracks are now being installed. Ample car-storage space is essential at this plant as there are no provisions for bin or stock-pile storage of the road gravel.

The plant is located on the Streator-Denrock branch of the C. B. & Q. Ry., which connects with the main line at Zearing, 12 miles north of Spring Valley. Connections with this railroad allow shipments to be made in all directions within a radius of 150 miles.

Main conveyor to screening plant and return conveyor from crusher in foreground.

This plant was designed and most of the equipment furnished by the Robins Conveying Belt Co. which also supervised erection of the plant. This company furnished the belt-conveyor idlers and drive pulleys, the conveyor belting, vibrating screens, feeder, gates, roller-chain drives and other miscellaneous items. All of the conveyor idlers have Alemite fittings. The troughing idlers have Timken roller bearings and the return idlers Shafer roller bearings. Robins Beltrainer return idlers are used on all of the conveyors. One of these idlers every 50 ft. keeps the return belt running true regardless of the condition of the other idlers or the belt. The two Gyrex screens are of the latest type.

Loading a car. Another loading track is to be built at the left.



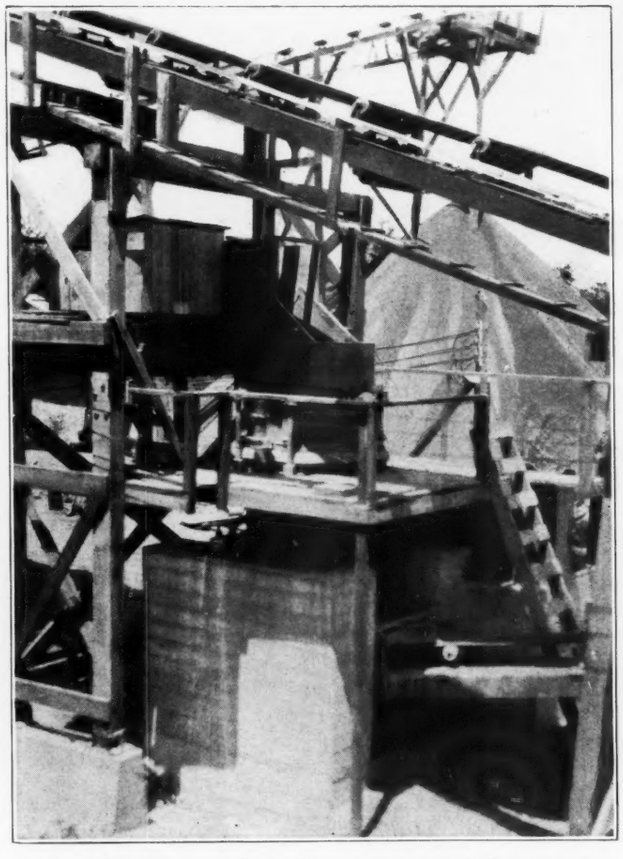
Speed-reducer drive of the loading conveyor.

Track hopper with belt feeder and the main conveyor below.

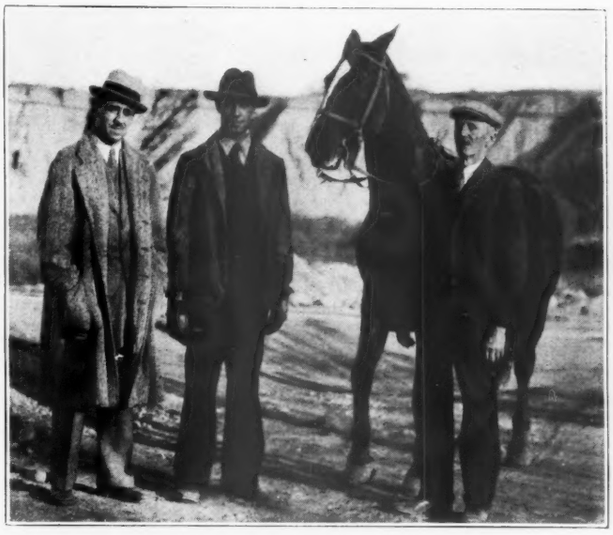
They can be adjusted to any desired angle in ½ min. while in operation. The screen used for preliminary fine separation operates at high speed and has a ¼-in. stroke. The second screen, for coarse separation, has a ½-in. stroke and operates at a slower speed. National Wire Cloth Co. spring-steel screen cloth is used on these screens. Something of a record was established in the construction of this plant as it went into operation on April 20, five weeks after work was started on the foundations.

Robins Everwear conveyor belting is used on the feeder and picking conveyors. These are flat belts of straight-ply construction designed for use where loads are spread evenly over the width of the belt. All other conveyors are of the troughing type and use Robins Durabelt conveyor belting. This type has more rubber cover at the center of the belt where the load is concentrated than at the sides. Jones Herringbone-Maag-gear speed reducers are used on the conveyor drives and Gilman V-belts on the screen drives.

Some of the refinements of design in this plant follow. All parts of this plant are entirely above ground. Even the trackhopper is readily accessible from all sides. All chutes have stone boxes and baffles which prevent any large material from falling directly on the conveyor belts or screens.



A view showing several of the conveyors and the secondary crusher.



The Sitterlys—Glenn, Lyle and J. C.

Provision has been made for the installation of washing equipment should this ever become necessary.

All motors are controlled from the main switchboard room in the screening building but each unit also has an individual control for starting and stopping. Most of the motors and other electrical equipment were furnished by the General Electric Co. All plant motors use 220-volt current while the electric shovel uses 440 volts. Electrolet conduit and outlets are used throughout the plant. Ideal galvanized corrugated-metal siding and roofing is used on the buildings. A Bates 25 tractor is used for general purposes about the plant.

The main office of the Western Sand & Gravel Co. is at 111 N. Spalding St., Spring Valley, Ill. Officers are: J. C. Sitterly, president; Glenn N. Sitterly, vice-president and secretary; and Lyle Sitterly, treasurer and superintendent. The company is almost entirely a family affair as J. C. Sitterly with his two sons and a daughter own most of the stock.

The company organized in 1909 under the present name and began operations in a small way on property leased from J. C. Sitterly. In 1912 he became manager of the plant and in 1916 bought the controlling interest.

The bin structure with ready-mixed-concrete plant at right.

# New Crushing Facilities on Dredge Cut Costs and Improve Quality

## West Virginia Sand-and-Gravel Producer Also Enters Ready-Mixed-Concrete Field

By MAT F. BEISBER

WITH the installation in 1930 of a ready-mixed-concrete plant and new crushing facilities aboard its dredge boat, a Wheeling, W. Va. sand-and-gravel plant has earned a just claim to being one of the most complete and efficient river operations in the industry.

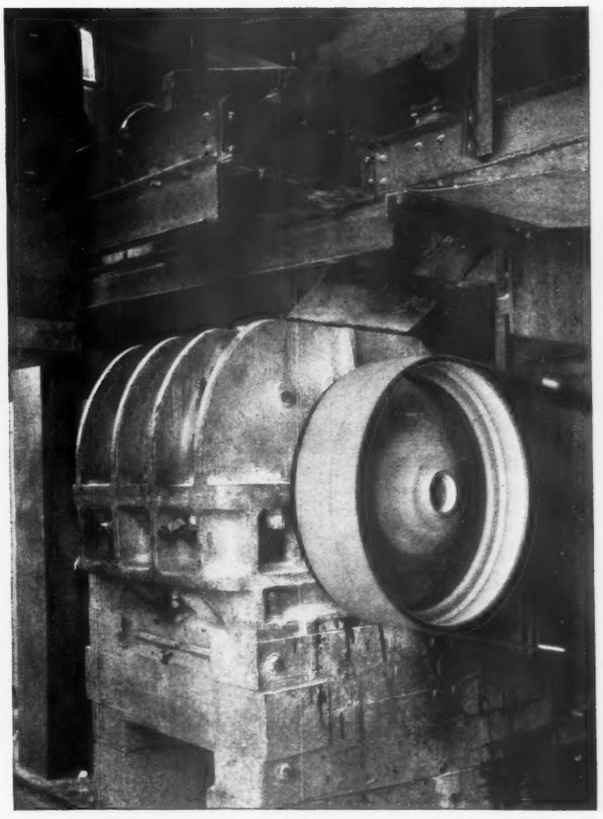
An inspection of this plant will immediately impress upon the visitor the fact that some one with more than ordinary mechanical ability has had a hand in the design and construction of the plant equipment. The same thoroughness and efficiency extend throughout, even to the towboat and the dredge. That man is W. T. Stump, one of the ablest and best-known Ohio River aggregate men. His company, the Standard Sand & Gravel Co., of which he is general manager, is now in its ninth year of successful service, serving neighboring sections of Pennsylvania, Ohio, and West Virginia.

Of more than ordinary interest is the improvement made on the company's dredge, the *Standard No. 1,* which operates on the Ohio River 10 miles above Wheeling. Production economy, as is well known, can be increased by either of two ways—(1) through the reduction of operating costs or (2) through increasing the output while operating costs remain unchanged. The *Standard No. 1* employs the latter means for increasing its economy of operation, and the gain is nearly 50 per cent. Through the installation of a crusher remarkably adapted to dredge-operating conditions, the *Standard No. 1's* output was doubled with no change in the crew or the operating time. Not only that, but the silica content of the sand, through the addition of crushed fines from the gravel, was increased sufficient to meet highway sand specifications, thus solving a condition which has long troubled river operators.

The *Standard No. 1* is a 90-ft. dredge, not unlike the average ladder-type equipment commonly used on inland waterways, and was designed by, and built under the direction of, Mr. Stump. It is fitted with a manganese-steel bucket-ladder, each bucket being of the ¼-cu.yd. size. The dredge machinery is powered by steam, there being two Brownell 70-hp. boilers aboard, each fired by Brownell automatic stokers.

Before the installation of the crusher, the river-run material was sent over a scalping screen to eliminate boulders and "niggerheads" and was then delivered to a jacketed rotary classifying screen. Here the sand was screened out, gravel below 1½ in. in size (or whatever limit the specification called for) was sent to the barge, and the "oversize"—40 per cent. or more of the total recovered from the river—was dumped back into the river. Obviously, the remedy for this waste of valuable material lay in the installation of a crusher. Dredge operators, however, are well aware that the installation of a crusher on a dredge presents problems of vibration, space, and foundation. Faced more and more with the necessity for lower operating costs, Mr. Stump finally installed an Ohio 4½-in. by 24-in. crusher manufactured by the James H. Beans Foundry Co. This crusher, because of its compact design, requires little headroom, being only 51 in. high. The dredge decking is not cut into for the crusher foundation, as this would tend to weaken the hull, but is mounted on timbers. It is operated by a 35-hp. steam engine through a belt drive, and, when running, its vibration is unnoticeable.

Since the installation of the crusher, the flow of materials has been altered, the crusher being operated in closed circuit with the rotary screen. River-run material is discharged directly to a 4-ft. by 6-ft. bar grizzly, which rejects 5½-in. and larger boulders. Delivery of the materials is then made to the rotary screen, which is equipped with perforated-plate screen sections called for by the specifications and a sand jacket. The sand is washed out to a settling tank by means of a jet and, at the settling tank, a drag bucket-conveyor delivers it to the sand barge. The gravel "throughs" from the screen are sent directly to the gravel barge, and the "oversize," which varies from 1½ in. to 5½ in., is chuted to the Ohio crusher. The latter, with a capacity of 40 tons per hour, crushes this material, which is then delivered back to the scalping screen by a Columbus Conveyor Company bucket elevator.



Crusher in operation on the barge.

Formerly the dredge output amounted to 2 barge loads per day; since the crusher installation, it has been increased to 4 per day with the same crew and operating time. Ohio River sand normally is deficient in silica content as judged by some highway specifications; with the addition of the crushed "fines" from the quartz and granite gravels, the silica content of the sand is made sufficiently high.

Derrick, barge and tow-boat equipment at the unloading dock.

View showing position of derrick for barge-to-car loading.

Another advantage of the crusher installation comes from the elimination of the time formerly lost in leveling the piles of rejected gravel on the river bottom. Formerly, after an accumulation of rejected gravel on the river bed, government inspectors required the dredge operators to return to the piles to level them for channel clearance.

At present the Standard Sand & Gravel Co. operates 12 steel barges, 8 of which were built by the American Bridge Co. and 4 by the R. M. DeVoe Co. They are all 26 ft. by 100 ft. in size and carry 400 tons each. The ends are built with bulkheads as a safety factor. For towing the barges to and from the dredge location, a gasoline-engine-driven towboat, the *Sandow*, is used. This boat, also built by Mr. Stump, has a 16-ft. by 65-ft. wood hull and is powered by a Foos single-cylinder 70-hp. gasoline engine. The *Sandow* has an 11-ft. by 14-ft. sternwheel. Under normal conditions two trips are made daily, each trip bringing in two barge-loads of materials.

A bird's-eye view of the shore plant will reveal its remarkable materials-handling facilities. Skirting the shore line of the Ohio River is the main-line entry of several railroads into Wheeling. Between the railroad and the river is the barge-unloading derrick. On the other side of the railroad are the truck-loading bin, ready-mixed concrete plant, stock-pile system, shops and the company's office. Thus, with the railroad adjacent to the derrick, cars can be loaded directly from the barges in one operation, eliminating the necessity for yard handling.

The derrick consists of a Terry Mfg. Co. 50-ft. mast with a 90-ft. boom equipped with a Hayward 2-cu. yd. bucket. The hoisting equipment consists of a Lidgerwood steam-driven swinging engine, and a Lidgerwood 3-drum hoisting engine. An inclosed operating room provides ample view of the derrick movement and protection against inclement weather. Two Brownell No. 416 return-tube boilers supply steam at a pressure of 125 lb. to the hoisting equipment, each boiler being rated at 70 hp. and fired by individual Brownell type 100a stokers.

The concrete plant with cement elevator at right.

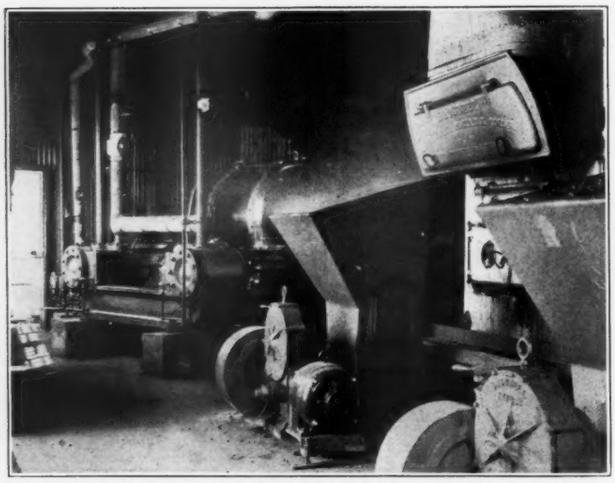
The derrick house is a substantial steel-and-concrete structure built approximately 30-ft. above the river level.

For delivery of the materials to the yard equipment there are a hopper and a bridge conveyor which spans the railroad tracks and delivers them to a bin structure. The bridge conveyor has a 28-in. belt 90 ft. long between centers. The feeder which supplies it with material from the hopper is driven from the conveyor tail pulley.

The bin structure provides storage facilities for about 900 tons of sand and gravel in 4 compartments. Only trucks for city delivery are accommodated by it, and for their convenience two aggregate-weighing batchers have been installed, one for sand and the other for gravel.

Directly in front of the bin structure the new ready-mixed-concrete equipment has been built, within easy access to the bins for aggregate sup-

(*Continued on page 62*)



Derrick machinery house showing hoist and boiler equipment.

# The Possibilities of the Lime-Chlorine Process in Sewage Treatment*

By W. V. BRUMBAUGH
*Asst. Secretary, National Lime Assn.*

WHILE the subject of the treatment of sewage is not new—the first studies having been made seventy-five years ago in London, followed in 1887 by experimental investigations in Lawrence, Mass.—nevertheless the complexity of the process, brought about by the changing character of the waste material to be treated and the chemical and biological reactions involved, necessitates constant new thought and research to cope with the situation and increase the overall effectiveness of the treatment.

Many processes have been devised, most of which were later discarded in favor of newer and better methods of treatment. Even to-day there are several different processes, or combinations of these processes, in use for the purification of sewage, but for the purpose of this discussion it is not necessary that the details be presented.

In recent years lime has been used to a limited extent in certain phases of sewage treatment, chiefly for the adjustment of the pH value, or acid-alkali ratio of the sludge in separate sludge-digestion tanks. However, it has been found that in many cases it is only necessary to introduce lime to increase the alkalinity of the sludge in the initial stages of the biological reaction, after which the process proceeds without additional lime. For this, and perhaps other reasons, it may be said that lime has been losing out in this particular field.

However, within the past few months, practical application has been made of a new process for treating sewage which will be of interest not only to manufacturers of lime and chlorine, but also to public works officials responsible for the efficient and economical operation of sewage plants.

Credit for the experimental work in connection with this new idea belongs to L. H. Enslow of the Chlorine Institute, who developed what is now known as the lime-chlorine process. It is adaptable to many different stages in the already existing methods of treating sewage and active promotional work is now being initiated by the Chlorine Institute and chlorine manufacturers who are members.

Chlorine has long been recognized as a disinfectant in the treatment of both water and sewage. The research of the Chlorine Institute definitely indicates an increased efficiency in sewage chlorination if the chlorine is applied in combination with lime as calcium hypochlorite. The addition of lime increases the alkalinity of the sewage at the point of application of the chlorine, which results in the chemical formation of the compound known as monochloramine from the ammonia naturally present in sewage. Monochloramine gradually changes to dichloramine, both compounds being effective and persistent in sewage disinfection.

The process for producing calcium hypochlorite at the sewage plant, which is flexible to the extent of permitting a variation in the lime-chlorine ratio to suit specific circumstances, consists in the introduction of chlorine into a milk-of-lime suspension. The lime emulsion is made by mixing water with a controlled amount of lime released by dry-feed machines operating continuously. The production of calcium hypochlorite occurs rapidly if proper and efficient mixing of the lime and chlorine is provided.

While the system affords an opportunity to regulate the ratio of lime and chlorine to meet specific conditions, the use of 1.25 lb. of lime to each pound of chlorine will generally be sufficient to bring about the proper chemical reactions and provide the desired excess alkalinity at the point of application to the sewage. Excess lime above the ratio mentioned will produce no undesirable effects and may actually prove beneficial if the alkalinity of the sewage is abnormally low. Conversely, a decrease in the lime used will lower the efficiency of the process.

The important point to remember is that, while chlorine alone will do the job if proper attention is given to the installation of equipment and control of the feed, the addition of lime greatly improves the efficiency of the process at reduced cost. For the sake of brevity, and at the same time to present in as concise a manner as possible the many distinct advantages of the lime-chlorine process, the following points are emphasized:

1. The lime-chlorine process may be applied to the treatment of sewage at different points for the accomplishment of various purposes such as odor control, sewer protection, disinfection, improved sludge digestion, higher efficiency of clarification in the settling tanks, etc.

2. For the attainment of a specific result less chlorine is required in the lime-chlorine process than would be necessary if chlorine alone was used. In other words, organic matter consumes less chlorine when lime is present and more bacteria are destroyed.

3. The cost of chlorination is reduced, even when the cost of adding lime is included. These cost ratios have been repeatedly proved to hold true for various sewages tested.

4. The compounds known as chloramines, which are produced from the ammonia naturally present in sewage when chlorine is applied in an alkaline carrier such as lime water, are very persistent bactericidal compounds, much more so than ordinary chlorine.

5. The lime-chlorine process insures the presence

(*Continued on page 44*)

*Read at 1931 National Lime Assn. convention at White Sulphur Springs, W. Va.

General view of a portion of the plant of the Ward Sand & Gravel Co.

# Steel Basket on Dredge Suction Nozzle Disposes of Oversize Stone

## F. L. Ward Perfects Device for Use at Sand-and-Gravel Plant at Oxford, Mich.

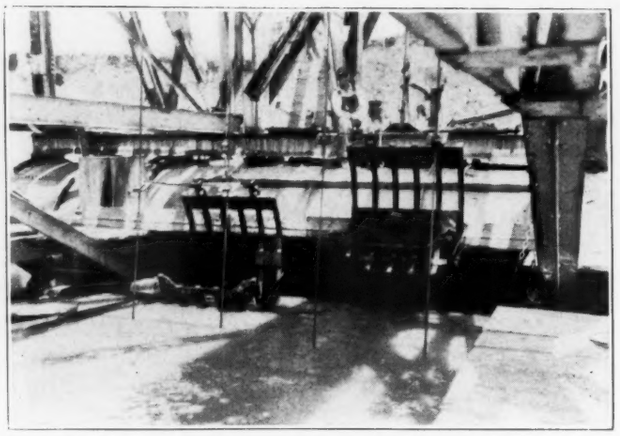
THE Ward Sand & Gravel Co. of Oxford, Mich., is well known throughout the sand-and-gravel industry of the Middle west. Its progress under the able direction of F. L. Ward, president and general manager, has been watched with much interest by leaders in the industry. Mr. Ward, with a keen engineering mind, has introduced and put into operation innovations that both engineers and practical operators were inclined to view with skepticism until they had seen the devices personally and had had practical proof that they would do all that was claimed for them.

The chief of these devices, perhaps, was the so-called Ward hydraulic jet, somewhat similar to the hydraulic elevator which has been known to gold-placer operators for many years. It consists of a cylinder with a pressure nozzle at the bottom directing a jet of high-pressure water upward through the center of the cylinder. This creates a vacuum which draws the material into the chamber and discharges it through a pipe leading back to a hopper barge. A full description of this device was published in the August 15, 1928 issue of PIT AND QUARRY.

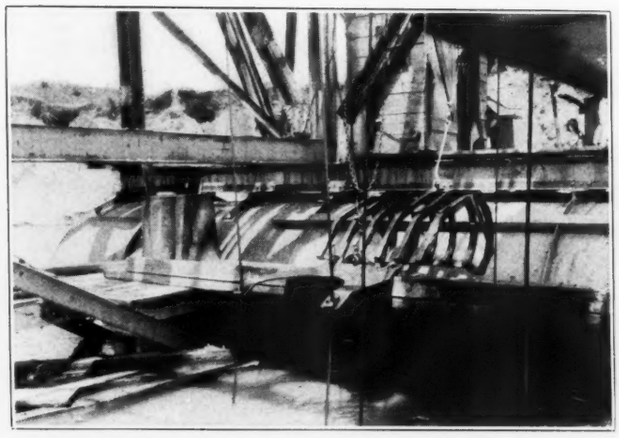
Although this system of excavating sand and gravel was put into successful operation in 1925, Mr. Ward continued to feel that it was not yet perfect. On this assumption he has devoted much time and effort toward improvements designed to free it as far as possible from mechanical difficulties and to speed up production.

Only one addition has been made recently, consisting of a scheme for removing oversize stone from the end of the nozzle, so that the hydraulic elevator will handle any deposit which contains a reasonable amount of oversize stone without materially affecting the volume of production. This innovation consists of a steel basket which is lowered and goes into place automatically under the nozzle. When an oversize stone catches and sticks on the end of the nozzle, the pump is stopped. This releases the vacuum and the stone drops off into the basket. Allowing just enough time for the stone to leave the nozzle, the pump is started again.

The arrangement and mechanical set-up of the pumps is such that they can be stopped, the vacuum shut off, the stone released from the end of the nozzle, and the pumps started again in less than one-half minute. Under the former practice, which



The baskets about to be lowered.



A basket in dumping position.

involved the raising of the nozzle to the top of the water and there removing the stone by hand, about three minutes were required. A remarkable saving of time is effected, therefore, by this new arrangement.

When the stone has dropped into the basket, the basket is raised by a drum hoist to the surface of the water, the stone is dumped out and rolled by hand back into a worked-out section of the pond, and the basket is returned to its position under the nozzle. Another advantage of this new method over the old one lies in the fact that stone may be removed from the nozzle without losing the priming of the pump.

The baskets, of which two are usually in operation, are of cold-rolled steel bars, and were built in the machine shop under Mr. Ward's direction. They are raised and lowered with the same hoist that raises and lowers the nozzle, equipped with ½-in. cables about 350 ft. long. A steel plate over the top of the basket serves to regulate its progress through the water when being lowered. This plate has a hole at either end and slides up and down on cables which are fastened to the nozzle. These cables guide the basket to its proper position.

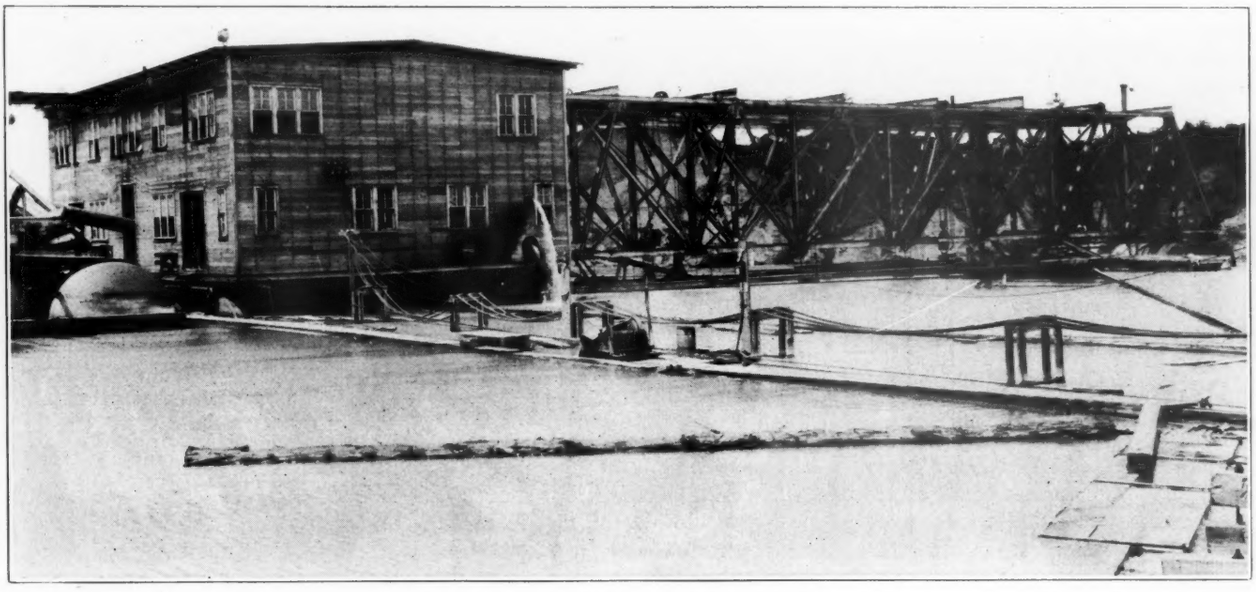
These baskets were first started in operation on April 15, 1929 and they have fulfilled every expectation. Their saving of time has far more than paid for their cost.

The hydraulic jet on the new dredge consists of duplicate units, which may be operated simultaneously. The suction pipes, 18-in. in diameter and 115 ft. long, lead back to the barge. The elevator operates at a depth of over 100 ft., although it usually works at a depth of about 70 ft. The elevator, which was first put into service in 1925, has operated continuously from that time to the present. It was installed on the new dredge which was finished and put into service in April, 1928. As compared with a centrifugal pump, it is claimed that the use of this device results in greatly decreased costs because it works faster and carries an average of 40 per cent. solids.

Another recent improvement designed, perfected and put into operation at this plant, consists of an arrangement for opening and closing the chutes on the loading bins by air. This arrangement has greatly increased the loading capacity and has reduced the loading expense. When operating at full capacity, loading is at the rate of about 35 cars per hour and, quite often, more than 170 carloads of material will be handled before noon. For this operation, a small air compressor operated by a 10-hp. General Electric motor is used.

An unusual testimony to the efficient operation of this plant is the fact that, for many months, there has been no major shut-down. Records at the office disclose the interesting fact that each day showed a normal output of material.

On the basis of production efficiency, as disclosed by his personal knowledge of the plant and office records, Mr. Ward feels that the time has come when this plant has almost caught up to its mechanical possibilities. This, together with the fact that

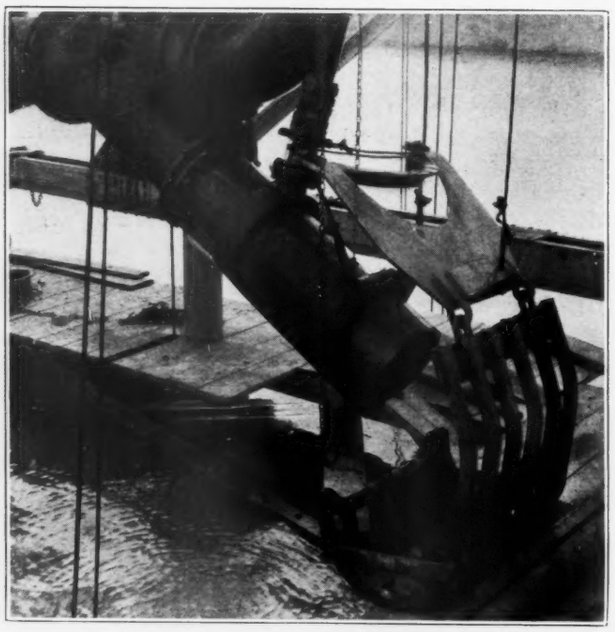


A view of the dredge and steel truss extension.

Conveyors, screening tipple and storage piles of finished material.

demand has fallen off to a slight extent, has brought production up to such a point that no special effort is needed to supply the demand.

Mr. Ward now finds it possible to turn his attention from mechanical and production problems to the problems of management and merchandising. Time saving, cutting costs through coördination of effort, and the use of daily production and cost statistics to further reduce overhead and to bring costs



The steel basket in position under the nozzle.

down are receiving attention. It is interesting to speculate on the possibilities of extending into this branch of the business innovations as important as have been put into practical operation in the mechanical-production departments. Already he has made some headway toward reducing costs and he promises to disclose some cost figures in the near future that will be fully as interesting as were the results accomplished by his hydraulic elevator.

As a means of accomplishing this result Mr. Ward has devised a complete record of power and labor costs and other statistical data, itemized as to different departments, covering all operations of the entire plant. This system has been in operation only a little more than a year but already it has shown striking results. Quite aside from the cost figures it tells an interesting story of improved morale and increased efficiency of the workers.

By noon of each day, for instance, Mr. Ward has a tabulated sheet on his desk showing the production, labor cost, accounts receivable and payable, time consumed in repairs or delays of any kind, and whether or not production and costs have exceeded or gone under the quota for each department. All records are complete not later than two o'clock p. m. showing the exact conditions of the business at six o'clock p. m. the preceding day. The repairs and supplies are also in continuous inventory and their records are completed at the same time.

These tabulated figures go to each of the foremen and the daily reports encourage the men to keep production up and the costs down by appealing to their personal pride in an efficient record; they inculcate friendly rivalry to see who can make the best record; and they keep the foremen on their toes because they know the boss will have on paper each day's record of their department.

## Fullers'-Earth Sales Increase Six Per Cent. in Quantity

The fullers' earth sold or used by producers in the United States in 1930 amounted to 335,644 short tons, valued at $4,326,705, as announced by the United States Bureau of Mines, Department of Commerce, which has collected statistics in coöperation with the state geological surveys. This is an increase of 6 per cent. in quantity and a small increase in total value in comparison with 1929.

# Methods and Cost of Milling Feldspar at a North Carolina Plant*

By B. C. BURGESS

*Manager, Tennessee Mineral Products Corp.*
*Consulting Engineer, U. S. Bureau of Mines*

THE Tennessee Mineral Products Corp. is engaged in mining and milling feldspar near Spruce Pine, N. C., a town of about 1,600 population on the Carolina, Clinchfield & Ohio Railway, 63 miles southeast of Johnson City, Tenn., and 30 miles northwest of Marion, N. C. The company operates a modern feldspar grinding plant with a rated monthly capacity of more than 6,000 tons of ground and granular spar. The mill site comprises 21 acres paralleling the North Estatoe River and lying between the State highway and the Clinchfield Railway. In addition to this site, the company owns 138 acres of mineral property in fee and holds leases covering approximately 1,500 acres of mineral land contained in 12 separate tracts, selected with a view of providing the plant with the necessary reserve tonnage of all grades of feldspar available in the district.

**THIS paper, describing the milling practices at the Minpro plant of the Tennessee Mineral Products Corp., Spruce Pine, N. C., is the first of a series being prepared by the U. S. Bureau of Mines on feldspar-milling methods and costs in the various feldspar producing areas in the United States. It describes not only the latest practices in feldspar grinding but includes studies of the cost of producing ground feldspar. These cost studies, obviously of interest to every consumer and purchaser of feldspar and to all feldspar grinders, are also of value to the small operator, who is generally prone to underestimate his real costs. It describes the latest practices in feldspar milling and includes detailed cost tabulations. A description of the recently installed milling unit for the preparation of granular Glasspar by graded crushing and magnetic separation is of particular interest. It illustrates how highly specialized feldspar milling has become, and to what an extent grinders are going to supply consumers with the products best suited for their particular needs.**

**The author is indebted to F. W. Horton, mining engineer, U. S. Bureau of Mines, for assistance in the preparation of this paper.**

The Tennessee Mineral Products Corp. had its beginning in 1921 when it undertook the mining of crude feldspar from the Wiseman property on Beaver Creek, Mitchell County, N. C. This property was abandoned in the summer of 1922 after extensive prospecting and development work failed to disclose enough feldspar of salable grade to permit profitable operation. The company then undertook a careful reconnaissance of the local feldspar area which is some 12 to 15 miles wide and 25 to 30 miles long. An exhaustive study was also made of milling and market conditions and, as a result, the company decided to enter the milling field. As a basis of operations, the Deer Park mines were acquired from the Blue Ridge Mining Co. on October 1, 1922, and as a successful source of high-grade potash spar, they have been of inestimable value in the growth and development of the company.

In 1923, the company installed a continuous grinding unit at Bristol, Va., and entered into an agreement making the Roessler and Hasslacher Chemical Co. of New York, N. Y., its exclusive sales agent.

As a result of the study which the company's engineers made of the general situation in the feldspar industry, they decided that, if any real progress was to be attained, chemical control throughout the milling process was essential. Accordingly, a laboratory was equipped at Bristol and complete chemical analyses were made of all crude spars and ground products. Screen tests were also made on all ground spars. At first, the trade received the new analyzed feldspars with the usual suspicion in the consideration of any new product. Only after concerted effort by the sales organization was the first carload sold to a white-ware plant and although this trial shipment was satisfactory it was not until June, 1923, three months after the first shipment, that a second carload order was received. Sales increased satisfactorily thereafter, the trade gradually beginning to appreciate the analysis service, so that by January, 1924, a sufficient market had been built up for Minpro feldspar to permit continuous operation of the mines and mill.

During August and September, 1923, the writer, with officials of the company, made a tour of all the feldspar deposits in the eastern United States and Canada, spending a sufficient length of time at each to note the type of deposit, the size and extent to which it was developed, the occurrence and distribution of the mineral and the method of mining. Wherever there was a feldspar grinding plant at the mine or along the route, it also was visited and its flow sheet, construction and operation studied. The information gathered on this trip of observation was utilized so practically as a basis for future operations that it seems pertinent to mention it here. Summarizing the information obtained on this trip and acquired from experimental work at the Bristol plant and from milling operations dur-

* Reprinted from U. S. Bureau of Mines Information Circular 6488.

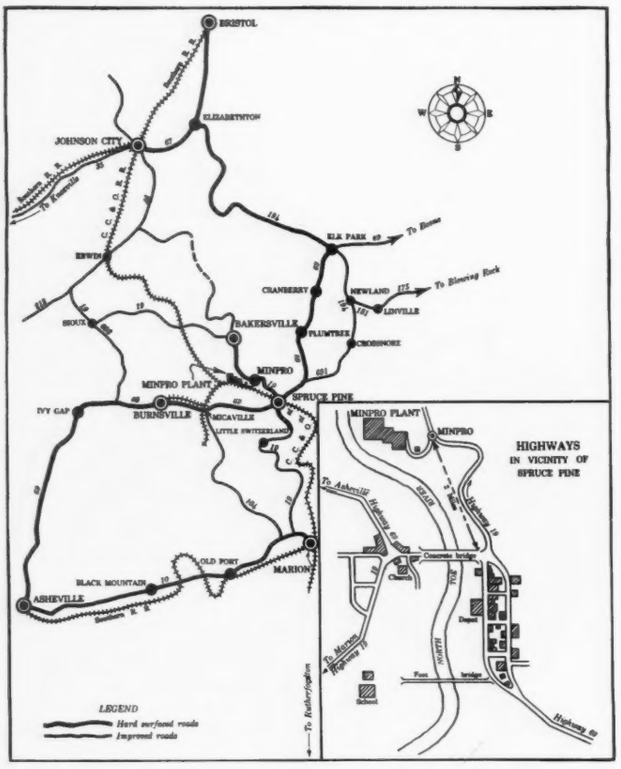



Fig. 1. Road map showing location of Minpro plant.

ing 1924 and 1925, the company was able to draw the following conclusions as to the requisites of a larger grinding plant:

ANALYSES AND FUSION DATA OF TYPICAL FELDSPARS AVAILABLE TO PRODUCERS IN THE SPRUCE PINE DISTRICT

| No. | Per cent | | | | | | | | | Fuse at cone | Color after fusion |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | $SiO_2$ | $Al_2O_3$ | $Fe_2O_3$ | CaO | MgO | $K_2O$ | $Na_2O$ | Loss on ignition | Total | | |
| 1 | 66.40 | 18.84 | 0.11 | 0.20 | Trace | 11.72 | 2.65 | 0 22 | 100.14 | 8+ | Good. |
| 2 | 68.03 | 17.73 | 0.07 | .78 | do. | 10.81 | 2.55 | 11 | 100.08 | 8+ | do. |
| 3 | 72.30 | 16.74 | .16 | 93 | do. | 4.31 | 5.62 | 23 | 100.29 | 6½ | do |
| 4 | 70 10 | 18.69 | .11 | 1.00 | do | 1.54 | 7.43 | .15 | 99.82 | 6 | do. |
| 5 | 71.61 | 17.68 | .15 | 1.49 | 0.03 | 1.43 | 7 02 | 43 | 99.84 | 6 | do. |
| 6 | 71.66 | 17.44 | 12 | 1.48 | do. | 1.63 | 7.30 | .18 | 99.81 | 6 | do |
| 7 | 71.68 | 17 93 | .13 | 1.25 | do. | 1.37 | 7.21 | .36 | 99 93 | 6–6½ | do. |
| 8 | 74.05 | 16 09 | .11 | 1.45 | 02 | 2.60 | 5.52 | 23 | 100.10 | 7 | do |
| 9 | 68.78 | 18.62 | 11 | 1.80 | .01 | 5.36 | 5.08 | 29 | 100 05 | 6 | do |
| 10 | 63.12 | 23.56 | .09 | 5.04 | .01 | .92 | 7.13 | .18 | 100.05 | | do |
| 11 | 69.45 | 18.95 | .16 | 3.70 | Trace | 2.72 | 5.11 | 21 | 100.24 | 7 | do |
| 12 | 66.20 | 20.93 | .12 | 2.65 | do. | 2.79 | 7.48 | .33 | 100.50 | 5–6 | do |
| 13 | 66.70 | 18.43 | 07 | .20 | do. | 12.38 | 2.02 | 22 | 100.02 | 8 ½ | do |
| 14 | 67.25 | 18.25 | .10 | 55 | do. | 11.48 | 2.01 | .35 | 99.99 | 8½ | do |
| 15 | 67.01 | 18.31 | .09 | .43 | do. | 11.15 | 2.63 | 32 | 99.94 | 8½ | do. |
| 16 | 66.48 | 18.70 | .08 | .32 | do. | 11.96 | 2.20 | .31 | 100.05 | 8½ | do |
| 17 | 66.25 | 18.74 | .11 | .40 | do. | 12.13 | 1.82 | .70 | 100.15 | 9 | do. |
| 18 | 65.80 | 19.17 | .09 | .52 | do. | 12.03 | 1.49 | .72 | 99.82 | 9½ | do |
| 19 | 68.18 | 17.89 | .11 | .60 | do. | 11.33 | 1.81 | .49 | 100.41 | 9½ | do. |
| 20 | 66.13 | 18.38 | .06 | .50 | .04 | 11.93 | 2.47 | .31 | 99.82 | 8½ | do. |
| 21 | 68.12 | 18.17 | .15 | .62 | 01 | 9.21 | 2.84 | .79 | 99.91 | 8+ | do. |
| 22 | 70.45 | 16.54 | .11 | .40 | Trace | 9.50 | 2.59 | .40 | 99.99 | 8½ | do. |
| 23 | 67.20 | 18.09 | .15 | .35 | .04 | 11.25 | 2.50 | .27 | 99.81 | 8+ | Fair. |
| 24 | 68.40 | 17.63 | .12 | .35 | Trace | 10.88 | 1.66 | .87 | 99.91 | 9 | Good. |
| 25 | 71.45 | 16.25 | .10 | .30 | do. | 9.05 | 2.53 | .66 | 100.34 | 9½ | do. |
| 26 | 71.04 | 16.61 | .09 | .62 | do. | 8.27 | 3.07 | .33 | 100.03 | 8 | Fair. |
| 27 | 71.19 | 16.69 | .08 | .45 | do. | 8.53 | 2.82 | .27 | 100.03 | 8+ | Good. |
| 28 | 70.55 | 16.91 | .14 | .70 | do. | 8.09 | 3.61 | .22 | 100.22 | 8– | Fair. |
| 29 | 66.60 | 19.06 | .09 | .65 | do. | 9.46 | 4.31 | .14 | 100.31 | 7½ | Good. |
| 30 | 67.20 | 19.69 | .11 | 1.45 | do. | 5.43 | 5.99 | .33 | 100.20 | 6–6½ | do. |
| 31 | 69.26 | 17.72 | .10 | 1.10 | do. | 6.85 | 4.88 | .29 | 100.20 | 7–7½ | do. |
| 32 | 69.58 | 17.47 | .17 | .78 | do. | 8.91 | 3.10 | .40 | 100.41 | 8 | Specky. |
| 33 | 70.03 | 18.95 | .08 | 1.27 | do. | 1.03 | 8.16 | .30 | 99.82 | 5½–6 | Good. |
| 34 | 71.93 | 16.70 | .16 | .67 | .01 | 6.31 | 3.94 | .33 | 100.05 | 7 | Specky. |
| 35 | 62.18 | 24.88 | .10 | 4.90 | .07 | .13 | 7.45 | .28 | 99.99 | 11 | Good. |

Fig. 1a. Analyses and fusion data of typical feldspars.

1. Two or more grades of spar could be separated economically from a run-of-mine product on a picking belt.

2. Crude spars should be segregated in storage.

3. Dry spar is essential for economical fine grinding and is produced most economically in a rotary drier.

4. Intermediate storage bins of sufficient size to allow operation at full capacity entirely from analyzed spar should be provided for crushed spar after its mechanical sampling.

5. These intermediate storage bins should be arranged so as to permit economical mixing to meet the customer's specifications.

6. Closed-circuit grinding with conical mills is more efficient than stage grinding.

7. A tube mill can be used economically to regrind the oversize from air separators when grinding finer than 140 mesh.

8. When using a continuous grinding process, mixtures must be carefully "neutralized" to provide desired changes in analysis for different shipments.

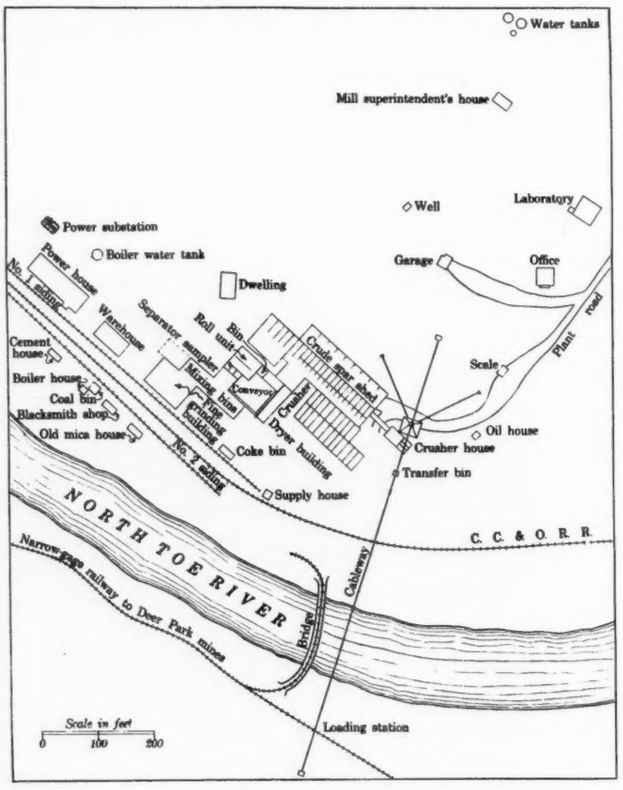



Fig. 2. Plan of the Minpro plant.

9. Reasonably close sizing can be obtained in the larger sizes of air separators by using different widths of baffle rings, provided the feed is thoroughly dry and constant in quality.

10. Great care must be taken in handling ground feldspar to keep it clean; small quantities of foreign material show up as specks in ware, although they do not show in an analysis.

As the Bristol plant was nearing full capacity, plans were made for a much larger unit, embodying

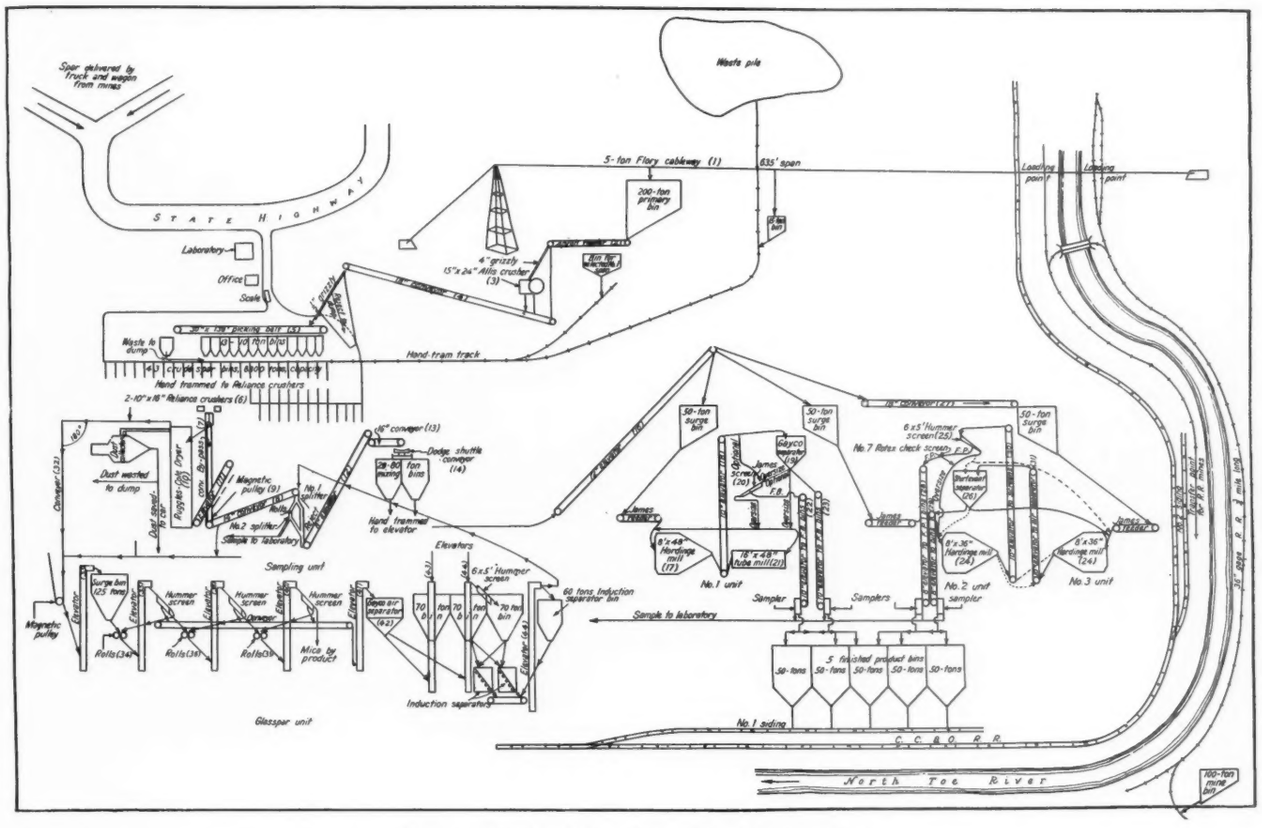



**Fig. 3. Graphical flow-sheet of the Minpro plant.**

## DETAILS OF EQUIPMENT

*The numbers of the following items refer to corresponding numbers on the graphical flow sheet (Fig. 3).*

(1) Cable-way hoist, run by 70-hp., 3-phase, 60-cycle, 750-r.p.m., Westinghouse induction motor; (2) Forty-eight inch Stephens-Adamson steel apron feeder, 10 ft. 6 in. between centers; (3) Driven by a 60-hp., 2,200-volt, 900-r.p.m., General Electric induction motor; (4) Eighteen-inch, inclined, 4-ply, rubber-belt conveyor, 70 ft. long, powered by a 5-hp., 3-phase, 60-cycle, 2,200-volt, 1,200-r.p.m., General Electric induction motor; (5) Driven by a 5-hp., 3-phase, 60-cycle, 2,200-volt, 1,200-r.p.m., General Electric induction motor; (6) Driven by two 15-hp., 3-phase, 60-cycle, 220-volt, 900-r.p.m. Westinghouse induction motors; (7) Fourteen-inch, 4-ply, rubber-belt conveyor, 82 ft. between centers, powered by a 3-hp., 3-phase, 60-cycle, 220-volt, 1,200-r.p.m., General Electric motor; (8) Driven from jack-shaft by the drier motor; (9) Twelve-inch diameter, 20-in. face; (10) Type L-10, driven by a 30-hp., 60-cycle, 2,500-volt, 900-r.p.m., G. E. motor.

(11) Ten-inch, 6-ply, rubber-belt Dodge bucket elevator with 9-in. by 6-in. malleable-iron buckets spaced on 2-ft. centers; (12) Eight-inch bucket elevator 22 ft. between centers with 8-in. by 5-in. by 5½-in. malleable-iron buckets on 1-ft. centers; (13) Sixteen-inch, 4-ply, rubber-belt conveyor, 16 ft. between centers; (14) Reversible, 14-in., 4-ply, rubber-belt Dodge shuttle conveyor 62 ft. between centers; (15) Three-phase, 60-cycle, 220-volt, 900-r.p.m., General Electric induction motor; (16) Twelve-inch, 6-ply, rubber-belt elevator 44 ft. 5 in. between centers with 12-in. by 6-in. by 6¼-in. malleable-iron buckets on 1-ft. centers; (17) Hardinge mill, 8 ft. by 48 in., lined with 9,100 lb. of Silex brick and charged with 12,800 lb. of 4-in. Danish flint pebbles. It is driven from a 100-hp., 3-phase, 60-cycle, 2,200-volt, 485-r.p.m. Fairbanks-Morse induction motor by an Allis-Chalmers Texrope drive, 60-in. centers, and having nine 1¼-in. by ⅞-in. belts; (18) Ten-inch, 6-ply, rubber-belt elevator 68 ft. between centers with 8-in. by 5-in. by 5½-in. malleable-iron buckets on 12-in. centers, driven by a 3-hp. Western Electric motor.

(19) Fourteen-foot, model 26, type H, size 14, Gayco centrifugal air-separator with a cone 7 ft. 6 in. high and tapering from 10 ft. 6 in. in diameter to 10 in. It has a ¼-in. steel shell and a 3/32-in. steel lining and is driven by a 20-hp., 220-volt, 900-r.p.m. General Electric induction motor; (20) James vibrating screen 3 ft. by 6 ft., direct connected to a 1-hp., 3-phase, 60-cycle, 220-volt, 1,200-r.p.m. Continental Electric induction motor; (21) Smidth tube mill 4 ft. by 16 ft., with 7/16-in. steel shell and 2½-in. Silex lining; load, 6,000 lb. of 2-in. flint pebbles; driven by a 25-hp., 3-phase, 60-cycle, 900-r.p.m. General Electric induction motor; (22) Ten-inch, 6-ply, rubber-belt elevator 37 ft. between centers, with 8-in. by 5-in. by 5½-in. malleable-iron buckets spaced on 12-in. centers, driven by a 3-hp., 220-volt, 1,200-r.p.m. Western Electric motor; (23) Ten-inch, 6-ply, rubber-belt elevator 54 ft. between centers, with 8-in. by 5-in. by 5½-in. malleable-iron buckets spaced on 12-in. centers, driven by a 3-hp., 220-volt, 1,200-r.p.m. General Electric motor; (24) Hardinge mill, 8 ft. by 36 in., lined with 8,125 lb. of Silex brick, charged with 11,600 lb. of flint pebbles, and driven from a 75-hp., 3-phase, 60-cycle, 220-volt General Electric induction motor by an Allis-Chalmers Texrope drive with 42-in. centers and having eight 1¼-in. by ⅞-in. belts; (25) Tyler 6-ft. by 5-ft., Type 31, Hum-mer vibrating screen equipped with type V16 electric vibrators; (26) Sturtevant 14-ft. air separator, driven by a 30-hp., 2,200-volt, 900-r.p.m. General Electric induction motor; (27) Eighteen-inch, 4-ply, rubber-belt conveyor, 19 ft. between centers, driven by a 5-hp., 220-volt, 1,200-r.p.m. General Electric motor; (28 and 29) Eight-inch, 5-ply, rubber-belt bucket elevators 64 ft. 6 in. between centers, with malleable-iron buckets 6-in. by 4-in. by 4½-in. spaced on 12-in. centers; (30) Ten-inch, 6-ply, rubber-belt bucket elevator, 80 ft. between centers with malleable-iron buckets 8-in. by 5-in. by 5½-in. spaced on 16-in. centers; (31) Ten-inch, 6-ply, rubber-belt bucket elevator, 67 ft. between centers, with 8-in. by 5-in. by 5½-in. malleable-iron buckets spaced on 14-in. centers; (32) Fourteen-inch, 4-ply, rubber-belt conveyor, 66 ft. 10 in. between centers, powered by 3-hp., 3-phase, 60-cycle, 220-volt, 1,200-r.p.m. General Electric motor; (33) Ten-inch, 6-ply, rubber-belt bucket elevator, 48 ft. 6 in. between centers with 8-in. by 5-in. by 5½-in. malleable-iron buckets spaced on 16-in. centers and powered by a 3-hp., 220-volt, 1,200-r.p.m. G. E. motor.

(34) Sturtevant balanced rolls, 22 in. by 14 in., run at 165 r.p.m.; (35) Eight-inch, 5-ply, rubber-belt bucket elevator, 33 ft. 6 in. between centers with 7-in. by 4½-in. by 5-in. malleable-iron buckets spaced on 16-in. centers; (36) Sturtevant balanced rolls, 20 in. by 14 in., making 195 r.p.m.; (37) Fourteen-inch, 4-ply, rubber-belt conveyor 21 ft. 6 in. between centers powered by a 3-hp., 3-phase, 60-cycle, 220-volt, 1,200-r.p.m. General Electric motor; (38) Same as 35; (39) Same as 36, except making 215 r.p.m.; (40) Same as 35; (41) Eight-inch, 4-ply, rubber-belt bucket elevator 33 ft. 6 in. between centers with 6-in. by 4-in. by 4½-in. buckets spaced on 16-in. centers; (42) Same as 19, except separator is Model 21.

Nos. 33 to 36, inclusive, and Nos. 38 to 42, inclusive, are powered by a 75-hp., 3-phase, 60-cycle, 2,200-volt, 690-r.p.m. General Electric induction motor which drives a jack-shaft by means of a 16-in., 6-ply, endless Hyflex rubber belt; (43) Eight-inch, 5-ply, rubber-belt bucket elevator, 26 ft. between centers, with 6-in. by 4-in. by 4½-in. malleable-iron buckets spaced on 16-in. centers; (44) Same as 43 except 51 ft. between centers.

Nos. 43 and 44 are powered by a 5-hp., 3-phase, 60-cycle, 220-volt, 1,150-r.p.m. General Electric induction motor driving through a jack-shaft; (45) Eight-inch, 5-ply, rubber-belt bucket elevator, 50 ft. between centers, with 6-in. by 4-in. by 4½-in. malleable-iron buckets spaced on 16-in. centers and powered by a 3-hp., 1,200-r.p.m. G. E. induction motor.

MINPRO FORM NO. 6

**TENNESSEE MINERAL PRODUCTS CORPORATION**

*ORDERS TO MILL FOREMAN*

To Mr. Brinkley Date 7-31 19 29

Unit No. 1 L. C. L. Shpmt. No. 11906

35 tons bulk bags 11"-200 mesh

Kind of bags

Ship to A General Ware Co.,

Address Ceramic Center

Bill out at once In car CC&O No. 8260

R. & H. NY No. 341 Car started AM PM Finished AM PM

*MIX*

Run the last 20 barrows of #1904 using the following:

| | | | | |
|---|---|---|---|---|
| 1 | Parts | S. P. | Mix Bin No. | 9 |
| 1 | " | C. F. | " " " | 7 |
| | " | Then go on with this shipment | " " " | |
| | " | using the following: | " " " | |
| 1 | " | S. P. | " " " | 9 |
| 1 | " | C. F. | " " " | 7 |
| 1 | " | H. P. | " " " | 16 |
| 2 | " | D. P. 1K | " " " | 5 |
| 1 | " | A. B. | " " " | 19 |
| 1 | " | D. P. 2K | " " " | 3 |

Specifications: 67.7% $SiO_2$, 10.0% $K_2O$, 2.9% $Na_2O$

Save 10 Lbs. of Samples. Grab sample to Lab. about AM PM

Compiled by J. E. Boyd Jr. Chief Chemist

Approved C. L. Morton Mill Superintendent

Fig. 4. Order to mill foreman giving feldspar mix.

all the improvements then known to the company and sufficiently flexible to permit changes and additions. Building of this new plant was started at Spruce Pine in February, 1926, and completed in December of that year. In August, 1927, the Bristol unit was moved to a place provided for it in the Spruce Pine plant. In 1928, both of these units being sold to capacity, a third unit was added; and a fourth unit, exclusively for the production of granular Glasspar, was completed in January of this year.

As its mines have always been developed well in advance of requirements, the company has never been in danger of having inadequate supplies of crude spar.

The plant is located on State Highway No. 19, two miles north of Spruce Pine on the north bank of the North Estatoe River and adjoining the Carolina, Clinchfield & Ohio Railway (see Fig. 1). The company's principal producing properties, the Deer Park mines, are situated about three-quarters of a mile down the river on the opposite bank and are connected with the mill by a narrow-gauge railroad and a 5-ton Flory suspension cableway. The 2½-ton buckets in which the spar comes from the Deer Park mines are conveyed by this cableway from the incoming terminal of the narrow-gauge railroad to the mill across the river. Crude spar and mill supplies arriving via the Clinchfield Railway are also transferred to the mill by this cableway.

The plant has two sidings on the Clinchfield Railway, one for unloading crude spar on its arrival at the plant and another for shipment of the finished product.

Crude spar arrives at the plant in three ways:

1. By wagon and motor truck from about 60 different mines, either leased by the company or privately owned. On account of the prevalence of hard-surfaced roads it is in some cases profitable to bring spar by motor truck from mines 18 miles away, although the average haul is probably not more than 6 miles.

2. By the Clinchfield Railway which brings spar from mines more accessible to the railroad than to motor haulage.

3. By narrow-gauge railroad from the company's Deer Park mines.

With 60 or more different sources of supply, the physical character and chemical composition of the crude spars arriving at the mill vary between wide limits and afford ample means for producing the 99 standard grades of original and mixed spars that the company offers to the consumer.

Crude spars coming to the mill range in size from fines to lumps weighing sometimes as much as 200 lb. These last, however, are exceptional, and the average size of the pieces is about 6 inches in diameter. On its arrival at the plant the purchased spar, already hand-sorted into different grades and containing only a small proportion of fines (usually less than 2½ per cent. through ⅜-in. mesh), is dumped directly into the crude storage bins. Feldspar from the Deer Park mines, on the other hand, is generally run-of-mine and is crushed and hand-sorted on a picking belt before it goes to the crude storage bins. Fig. 1a shows the analyses and fusion data of 35 characteristic crude spars coming to the mill.

As the present Minpro plant embodies all the ideas developed through the Company's research and operating experience since its inception, it will be described in detail, particularly the important features of chemical control and its concomitants of unusually complete segregation of individual spars in crude storage, automatic sampling, "neutralization" during continuous grinding, and the great flexibility of its flow sheet.

Fig. 2 shows the plan of the plant and Fig. 3 its graphical flow sheet.

All spar broken in the company's Deer Park mines is generally hoisted and sent to the plant as run-of-mine without any sorting except the picking out of large blocks of mica. This spar is carried by the narrow-gauge railroad and cableway, previously mentioned, to a 200-ton storage bin which takes up the surge between the cableway and sorting plant.

The Flory cableway of 2-in. wire rope has a span of 635 ft. and is operated by the double-drum, spur-gear, friction cableway hoist run by a 70-hp. motor (1).

Spar from the 200-tons primary bin is fed onto a grizzly made of deformed steel bars spaced 4 in. apart by a 48-in. Stephens-Adamson apron feeder (2) driven from a jack-shaft run by the crusher

TABLE I. AVERAGE ANALYSES OF PICKING-BELT PRODUCTS FROM CRUDE SPAR FROM DEER PARK MINES

| Product | Per Cent | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | $SiO_2$ | $Al_2O_3$ | $Fe_2O_3$ | CaO | MgO | $K_2O$ | $Na_2O$ | Loss | Total |
| No. 1 potash spar | 66.40 | 18.70 | 0.09 | 0.56 | Trace | 11.53 | 2.63 | 0.16 | 100.07 |
| No. 2 potash spar | 68.52 | 17.65 | .10 | .54 | .01 | 10.22 | 2.67 | .18 | 99.89 |
| No. 1 soda spar | 72.01 | 16.66 | .11 | 1.12 | .01 | 5.33 | 4.58 | .23 | 100.05 |
| No. 2 soda spar | 72.95 | 16.85 | .15 | 1.55 | Trace | 1.58 | 6.81 | .16 | 100.05 |
| Flint (quartz) | 98.29 | 1.08 | .03 | .36 | | | | .05 | 99.81 |
| Mica[1] | 45.2 | 39.5 | | | | 11.8 | | 4.5 | 100.00 |

[1]Theoretical analysis.

motor. Large pieces of No. 1 potash spar are picked directly from the apron feeder and chuted to a small bin beneath, from which they are transferred to a crude bin containing the same grade of spar. A speed adjustment on the feeder and an electric signal system connecting with the picking-belt room permits regulation of the feed to the picking belt. The oversize from the 4-in. grizzly goes to a 15-in. by 24-in. Allis-Chalmers jaw crusher set to crush to 4 in. and driven by a 60-hp. motor (3). Spar from the crusher and undersize from the 4-inch grizzly fall upon an 18-in. conveyor (4) which carries them to a ½-in. grizzly of deformed steel bars.

The fines through this small grizzly go to a waste dump and the oversize to a 30-in., 4-ply rubber picking belt, 138-ft. long (5) provided with chutes on each side between which the pickers stand. These chutes connect with thirteen 8-ton transfer bins. A tram-car line beneath these bins and over the crude-spar bins permits the transfer of the picking-belt products to any of the crude bins. The transfer bins can be by-passed so as to drop the picking-belt products directly to the crude bins beneath.

Sixteen women and girls and three men is the average crew on the picking belt. They select 25 to 40 tons of material from the 70 to 80 tons run over the picking belt in 10 hours, the quantity removed depending upon the quality and size of material from which it is picked. One of the men is foreman and the two other men are cobbers. Six products are picked from the belt, all from material from one mine or from that of two or more mines combined.

The first girl picks pure flint, the next two remove No. 1 potash spar. Then two girls pick out No. 1 soda spar. Following these, two or three girls pick No. 2 potash spar. The balance of the girls, excepting one picking mica, remove whatever spar remains on the belt. This last product is all classed as No. 2 soda grade. Whatever spar is saved by the two men cobbing at the discharge end of the belt also goes into this grade. The discharge from the belt falls into a bin from which it is trammed to the waste pile. Women have been found to grade the spar more carefully than men and they work for only a little more than half the wages it would be necessary to pay men for this class of work.

The average analyses of the products from the belt which are surprisingly uniform from month to month, are shown in Table I.

The stocks of crude spar are contained in 43 bins and additional ground storage. They are increased from a minimum of 4,000 tons in summer to 8,000 tons in winter and represent at least 20 different grades of spar, varying from high potash and low soda content through the intermediate grades to the other extremes of high soda and low potash content. The various grades are allotted a number of bins proportional to the annual tonnage of each consumed. For instance, there are many grades which are allotted only one bin each. On the other hand, more commonly used grades may be allotted five or six bins.

The crude spar is transferred from these bins in wheelbarrows, each grade separately, to two Reliance jaw crushers. While forking the spar into the wheelbarrows, some fines are removed which are later put over a ¼-in. screen. The undersize is wasted and the oversize saved and run as a separate grade of crude spar.

Mechanical devices to replace this hand-loading, screening, and transferring in wheelbarrows have been studied, but none has been found low enough in first cost to give a final cost, less than the present handling expense per ton.

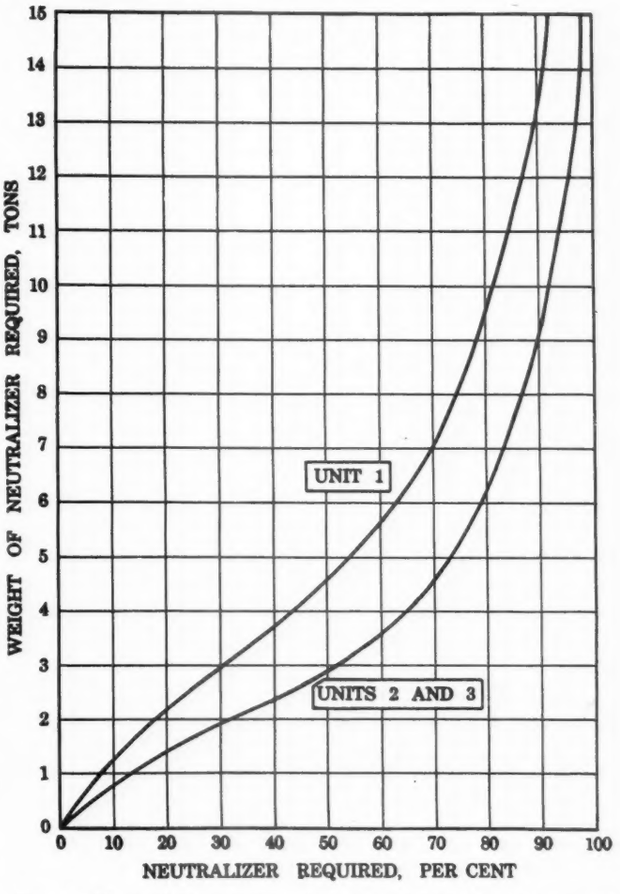



Fig. 5. Neutralization curves showing weight and percentage of neutralizer required.

The two Reliance jaw crushers (6), which reduce the crude spar, have openings of 10-in. by 18-in. and are set to crush to ½-in.

A belt conveyor (7) carries the crushed spar either to a 14-in. cross conveyor (8) which carries it to the sampling unit, or by means of a tripper on the first conveyor dumps the spar into a rotary drier which has been found to so improve the product and increase grinding efficiency that all spar is now passed through it.

A motor which drives the first conveyor also runs a ¾-kw. Northwestern direct-current generator at 1,300 r.p.m. to supply current to a high-duty magnetic pulley (9) which picks out all the tramp iron from the discharge of the conveyor.

About 0.2 lb. of magnetic material is removed per ton of spar passing over the pulley. A large part of the metallic iron extracted is in the form of bolts, nuts, broken drill steel, nails, etc., although a small percentage of abraded iron and a little magnetite are removed.

The Ruggles-Coles rotary drier (10), 70 in. in diameter and 30-ft. long, has a ⅜-in. steel-plate shell and a Silex refractory lining 4½-in. thick. The drier is of the direct-heat, counter-current type, and is rotated 5½ times per minute by a 30-hp. motor. The furnace of the drier has an auxiliary stack for starting and baffles to prevent cinders from getting into the drying cylinder. A stock grade of coke is used for fuel, costing $6.57 per ton delivered at the plant. The drier has a capacity output of 10 tons per hour of dried spar containing feed through a ¾-in. ring and containing 8 per cent. moisture. With the average moisture content in the feed, 17 lb. of coke will dry a ton of feldspar.

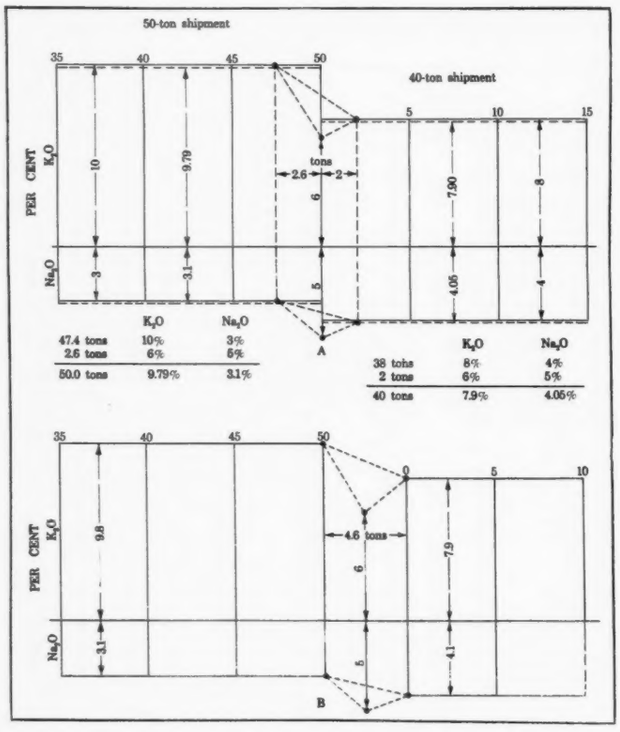



Fig. 6. Two methods of changing mixes (neutralizing), (A) where consecutive lots vary little in analysis, and (B) where they vary considerably.

In lining the drier, ten rows of Silex brick were placed on end to form lifters to cascade the feldspar through the hot furnace gases. These lifters have been effective in lowering fuel requirements and increasing the capacity of the drier.

A No. 55 Clarage exhaust fan pulls the air against the flow of spar and in so doing extracts practically all of the minus 40-mesh material. These fines contain considerable mica, clay, and other impurities, and in removing them an improvement is made in the quality of the finished product that more than offsets the cost of drying. The dust from the driers is collected in a cyclone-type, galvanized-iron, dust collector, 8 ft. in diameter.

The discharge from the drier falls into the boot of a bucket elevator (11) and is returned to the head end of the first-mentioned 14-in. conveyor, which discharges it over the magnetic pulley to a 14-in. cross conveyor by which it is carried to the less than one-half of 1 per cent. of moisture from a sampling unit; or the discharge of the bucket elevator may be by-passed to the granular Glasspar unit, which is described later.

The sampling unit receives all spar from the crushers and drier and from the granular Glasspar unit. A swinging chute actuated by a revolving cam removes 2 per cent. of the feed and passes it to a set of 12-in. by 12-in. Sturtevant rolls crushing to 8 mesh. Under the rolls is another sampler of similar design which removes 5 per cent. of the discharge from the rolls. The resulting sample is 5 per cent. of 2 per cent., or 1 lb. out of every 1,000 lb. entering the sampler.

The reject from the sampler, constituting 99.9 per cent. of the feed, is raised by a bucket elevator (12) to a cross conveyor (13) which feeds a shuttle conveyor (14) mounted on a track over the mixing bins. This conveyor is reversible so that it can load any one of the 29 mixing bins beneath it.

All machines in the sampling unit are driven by a 20-hp. motor (15) from jack-shafts.

Each grade of crude spar is run to the crushers separately and passes through the drier and sampling unit to a separate mixing bin. As the capacity of each mixing bin is 80 tons, a 160-lb. sample (1 lb. from each 1,000 lb.) represents a full bin. Smaller lots down to 30 tons are often handled, resulting, of course, in a proportionally smaller sample. All samples are sorted and split down by standard methods and sent to the laboratory for complete chemical analysis. No spar from a mixing bin is withdrawn until its analysis is reported.

The 29 mixing bins supply an intermediate storage of 1,700 to 2,300 tons of crushed material in 29 separate lots which have been analyzed and are ready for fine grinding.

When an order for spar is received it is sent to the laboratory, where a mix calculated from the analyses of the spar in the mixing bins is made to fit the customer's specifications. An order (Fig. 4) is then issued by the chief chemist to the mill foreman with the approval of the mill superintendent, showing the number of barrows to be drawn from each bin to make up the shipment. These barrows, containing 330 lb. each, are drawn in rotation as

indicated on the order and dumped into the boot of an elevator (16) which empties into the 50-ton surge bin of the particular fine-grinding unit in which the lot is to be ground.

The fine-grinding department consists of three Hardinge-mill units, each fed from a 50-ton surge bin by James automatic-belt feeders. Unit 1 has an 8-ft. by 48-in. Hardinge mill (17), the discharge from which is lifted by an elevator (18) either to a Gayco air separator (19) or a James vibrating screen (20), according to whether the product being prepared is fine (120 to 250 mesh) or coarse (20 mesh). If a product of intermediate size (40 to 100 mesh) is being made, the fines are first removed by the Gayco separator and the coarse material is then transferred to the screen where the final sizing is accomplished.

A tube mill (2) is operated for fine grinding in connection with Unit 1. This mill receives about half the oversize from the Gayco separator and reduces it with less power than if the same grinding were done in the conical mill. The other half of the oversize is returned to the Hardinge mill. The use of the tube mill increases the plant capacity about 8 per cent.

Finished products from the screen and separator are lifted by elevators (22 and 23) to the top of the plant, where automatic samplers similar to those in the sample unit take a final sample of the finished product, which is chuted into any one of five finished-product bins, each of 50-ton capacity.

Fine-grinding units 2 and 3 are similar to unit 1 except that each of the Hardinge mills (24) is smaller, being 8 ft. by 36 in., and a double "Hummer" screen (25) is used in conjunction with a Sturtevant air separator (26). The conveyor (27) and elevators (28 to 31) in these units are described under "Details of Equipment."

All the chutes and feeding mechanisms in the fine-grinding department are lined with Silex or rubber. The Hardinge mills are Silex lined, use flint pebbles as the grinding medium, and rotate from 27 to 28 revolutions per minute.

The samples of finished products that are taken by the automatic samplers are sent to the laboratory and checked against the calculated analyses. A 2-ounce sample of every shipment is kept at the laboratory as a permanent record. Samples of products for which there is a steady demand from prospective customers are stored in the warehouse adjoining the plant.

From this description and the flow sheet (Fig. 3), it will be seen that the design of the fine-grinding department provides great flexibility of operation so as to permit maximum use of the equipment and gives a large capacity to handle rush orders.

In any continuous grinding process where lots of material of different analyses are ground consecutively, the material in the mill must be entirely ground out or a neutralizer added either between lots or before the grinding of the lot in the mill is completed, in order that it and the following lot shall each be of the desired analysis.

It is impracticable to run a Hardinge mill or any similar type of pebble mill until the material which

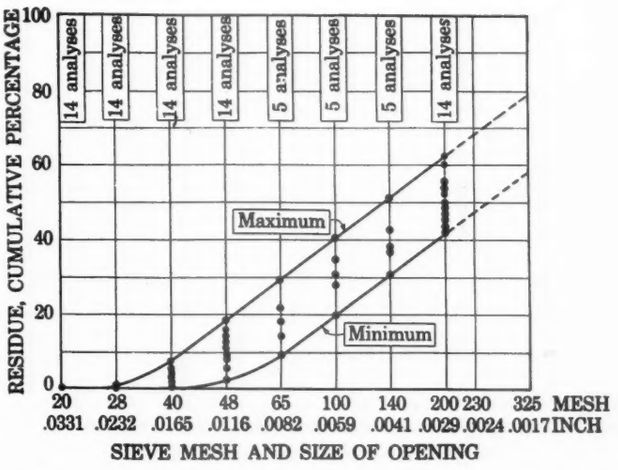



Fig. 7. Screen analysis of 20-mesh product from conical ball mill and vibrating screen.

it has been grinding is completely discharged; first, because it would take several hours to clear the mill, and second, because as the material being pulverized runs out of the mill, it leaves the pebbles to rattle against each other so that they would soon be ground down and broken to pieces, resulting in contamination of the product and loss of the pebbles themselves. Another way to clear the mill would be to dump the charge as in batch grinding, but if this were done, the advantages of continuous grinding would be lost.

Neutralization is therefore the only practical means of establishing uniformity of analysis in each lot and maintaining economy of operation. It may be effected in two ways; one, which we will call Method A, is to begin adding the neutralizer at some point before the entire tonnage for the lot already in the mill has been fed, the neutralizer, of course, being of such composition that when added in a calculated proportion to the charge in the mill, it will give the analysis required for the following lot. Method B is to feed the entire tonnage required for the first lot and immediately start feeding the neutralizer until a sufficient quantity of it is in the circuit to completely change the analysis of the first lot to the analysis desired for the second lot. At the point where this complete neutralization takes place the regular feed for the second shipment is begun. In Method A the portions of the neutralizer absorbed by the preceding and following lots, respectively, affect the analyses of the two lots because they become an integral part of each and they must be allowed for in calculating the original mixtures for the two lots. In Method B the neutralizer is entirely removed, not going into either lot but being bagged and stored for future use.

Method A can, therefore, be used only for bulk shipments where the difference in the analyses of consecutive lots is not great. Correspondingly, Method B is used where there are wider differences in the analyses of the lots involved or for bag shipments where there is no opportunity to mix the neutralizer uniformly through the entire tonnage of the shipment.

The quantity of material in the grinding circuit

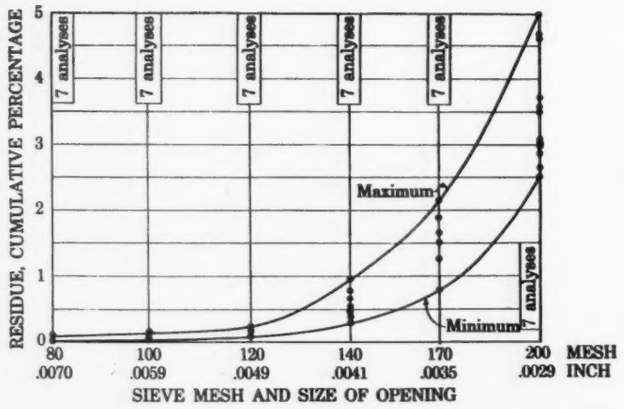



Fig. 8. Screen analyses of 140-mesh product of conical ball mill and air separator.

is of course a determinant of the quantity of neutralizer which must be added to make the necessary change in analysis and is obviously entirely dependent upon the size of the grinding equipment. In order to determine the quantity of neutralizer that must be added to each of the fine-grinding units at the Minpro plant, a definite change in the feed to each of the fine-grinding units was made, and samples of the product, taken at 15-minute intervals, were analyzed, and the results plotted to give curves (Fig. 5) showing how many tons of neutralizer must be added to obtain the analysis required for a new lot in each of the Hardinge-mill units.

Simple illustrations will show how the two methods of neutralization are used and how the quantity of neutralizer required is calculated.

Suppose we have a 50-ton bulk shipment with specifications requiring slightly under 10 per cent. potash and slightly over 3 per cent. soda followed by a 40-ton bulk shipment with specifications just under 8 per cent. potash and 4 per cent. or slightly higher soda. Assuming that we have a spar containing 6 per cent. potash and 5 per cent. soda suitable for making the change in the mixture, it is apparent that an equal quantity of this neutralizer added to any portion of the 50-ton shipment will give the analysis required for the 40-ton shipment. Referring to the neutralization chart, Fig. 5, and running up the line which represents 50 per cent to the curve for unit 1, we find this line intersects the curve at 4.6 tons. This, therefore, is the quantity of neutralizer that must be used to make the desired change. The neutralizer will be divided between the two shipments approximately in the proportion of their weights by adding 2.6 tons of it to the 50-ton shipment and 2 tons of it to the 40-ton shipment. We will, therefore, feed 47.4 tons of the 50-ton shipment, immediately following with 2.6 tons of the neutralizer; the 50-ton shipment will then be completed, and the discharge of finished product will be changed to the bin which is to receive the 40-ton shipment. There will be no interruption of the feed or grinding at all. After 2 more tons of the neutralizer are fed, completing the 4.6 tons required, the regular feed for the 40-ton shipment is commenced.

The resulting analysis of the 50-ton shipment will be 9.79 per cent. of potash and 3.10 per cent. of soda, and of the 40-ton shipment 7.90 per cent. of potash and 4.05 per cent. of soda.

A graphic representation of the effect on the potash and soda content of the two lots in neutralizing by these two methods is shown in Fig. 6. Other constituents are affected similarly.

Since a bulk shipment is loaded in horizontal layers throughout the length of a box car and in addition is fairly well mixed in passing through the elevators and bins, the neutralizer added at the end and beginning of the respective shipments will be thoroughly distributed through the two cars in which the shipments are made.

In Method B, none of the neutralizer will appear in either shipment, so that the original mixtures for

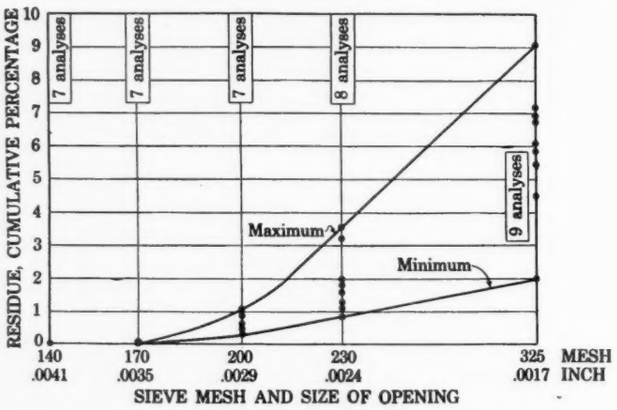



Fig. 9. Screen analyses of 200-mesh product of conical ball mill and air separator.

them can be calculated without allowing for the neutralizer which when ground is removed and stored until an order is received for material of the same screen size and analysis to which it can be added.

Inasmuch as a crushed spar, free from fines, is desired by the glass industry, crushing in the Glasspar unit is done with rolls instead of pebble mills, which are universally used in the ordinary grinding of feldspar.

The discharge from the Reliance crushers (6), which are set to crush to about ½-in. size or from the drier (10) is transferred by a conveyor (32) having a magnetic head pulley to the boot of a bucket elevator (33) discharging into a 125-ton surge bin that supplies the feed to the Glasspar unit.

From the surge bin the ore is fed by chute to Sturtevant rolls (34) set ⅜-in. apart. The discharge from the rolls is elevated (35) to a double-deck Hum-mer screen with ¼-in. and 20-mesh screens. Oversize on the coarser screen is returned to the rolls; the intermediate size goes to a second set of Sturtevant rolls (36) set $\frac{3}{16}$-in. apart; and the undersize through 20 mesh, which is now finished as to maximum size, is carried by a belt conveyor (37) and elevator (41) to a Gayco air separator (42) for removal of fines. The discharge from the second rolls (36) is elevated (38) to a second double-deck Hum-mer screen with 8 and 20 mesh screens. The oversize from the coarser screen

is returned to the rolls, the intermediate size goes to a third set of Sturtevant rolls (39) set close, and the undersize through 20 mesh proceeds to the Gayco separator.

The discharge from the third set of rolls is elevated (40) to a third double-deck "Hum-mer" screen with 10 and 20 mesh decks. Oversize on the 10-mesh screen, consisting principally of mica, is removed as a by-product, the intermediate size is returned to the rolls, and the undersize through 20 mesh joins the similar products from the preceding screens on their way to the Gayco separator.

Although the rolls produce only a small fraction of the fines which are made by the ordinary process of grinding in pebble mills, there is still a little minus 140-mesh material in the undersize through 20 mesh. To remove this, the product is put through the Gayco separator (42) and the extracted fines are elevated (43) to a separate bin for use with similar products from the fine-grinding department.

The oversize from the Gayco separator is elevated (44) to a Hum-mer screen, which separates

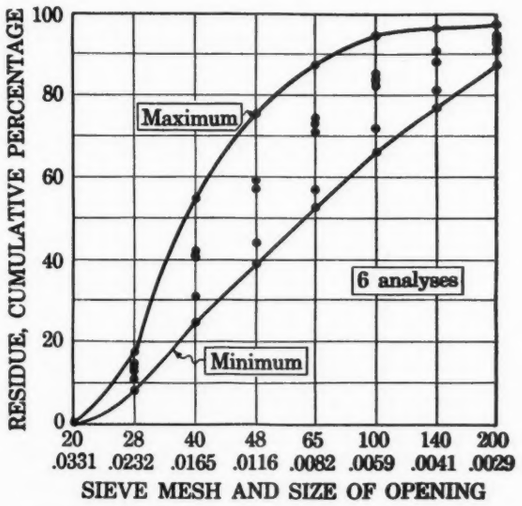



Fig. 10. Screen analyses of 20-mesh product of Glasspar unit.

it into two sizes; minus 20 plus 40 mesh, and minus 40 plus 140 mesh. These two sizes are held in 70-ton feed bins, from which they run over two Johnson induction separators, one size going to each machine.

The Johnson separators are of the electromagnetic induction type. Each machine has two large coils, an upper coil with three pole pieces at each end, and a lower coil with two pole pieces at each end. A laminated rotor, 30 in. long, revolves under each of these pole pieces. A special device feeds a thin uniform stream of the sized spar over the length of each rotor. As the material passes from one rotor to the next, all magnetic particles are deflected by the rotors, permitting the feldspar to continue on through five successive cleaning treatments. Each rotor removes a portion of the contaminating minerals, the more highly magnetic being removed by the upper rotors and the feebly magnetic by the lower rotors.

The strength of the magnetic field developed by the Johnson induction separator is phenomenal, and as the separation depends on the deflection of magnetic particles in falling rather than on lifting, astonishing results are obtained, in that minerals even with traces of iron are removed. For example, muscovite without visible iron stain is removed from the spar which, prepared by this method, consistently contains less than 0.06 per cent. of iron or about one-half of the usual maximum specification for this type of spar.

The cleaned spar from the Johnson separators is elevated (44) to the sampling unit, a mechanically accurate sample taken, and the material stored in the mixing bins until the analysis of the sample is reported.

Mixtures of two or more grades of granular Glasspar are made to meet the customer's specifications by the same chemically controlled methods as the company uses in making its other products. Before shipment the mixed material is carefully rescreened to remove any oversize which might have gotten into it. From the check screen the granular Glasspar goes directly into the cars.

Typical screen analyses, according to the classification specified by Commercial Standard CS23-30 of the U. S. Bureau of Standards, of 20, 140, and 200 mesh spars produced in the fine grinding department and of 20-mesh spar from the granular glasspar unit are given in Figs. 7 to 10, inclusive.

Fig. 11, showing the comparative screen analysis of the 20-mesh product from one of the Hardinge-mill units and from the granular-glasspar unit is of particular interest, as it illustrates the vast difference between the two products and shows to what an extent the fines have been eliminated from the Glasspar.

TABLE II. DETAILS OF MILLING COSTS
(*Cost per ton.*)

| | Labor | Liability Insurance | Coke | Oil | General Supplies | Power | Repairs | General | Total |
|---|---|---|---|---|---|---|---|---|---|
| Preliminary milling: | | | | | | | | | |
| Crude-bin expense | $0.0168 | $0.0004 | | | | | $0.0017 | | $0.0189 |
| Tramming to Reliance crusher | .1982 | .0047 | | | $0.0029 | | .0020 | | .2078 |
| Fine crushing and conveying | .0099 | .0002 | | $0.0043 | .0003 | $0.0185 | .0104 | | .0436 |
| Drying | .0545 | .0013 | $0.0440 | .0031 | .0029 | .0114 | .0057 | | .1229 |
| Sampling and conveying | .0071 | .0002 | | | .0013 | .0108 | .0135 | | .0329 |
| Total milling cost to mixing bins | .2865 | .0068 | .0440 | .0074 | .0074 | .0407 | .0333 | | .4261 |
| Finishing: | | | | | | | | | |
| Mixing-bin expense | .0735 | .0017 | | | .0001 | .0070 | .0049 | | .0872 |
| Fine grinding | .2020 | .0048 | | .0153 | .0409 | .4075 | .0731 | | .7436 |
| Total finishing expense | .2755 | .0065 | | .0153 | .0410 | .4145 | .0780 | | .8308 |
| Loading and shipping | .1224 | .0029 | | | .0634 | | .0032 | $0.0018 | .1937 |
| Total | $0.6844 | $0.0162 | $0.0440 | $0.0227 | $0.1118 | $0.4552 | $0.1145 | $0.0018 | $1.4506 |

TABLE III. COST IN DOLLARS AND IN UNITS OF POWER AND LABOR OF GRINDING FELDSPAR TO VARIOUS SIZES

(*Period covered—1929.*) (*Tons produced—34,108*)

| Mesh | Total Tons Ground | Total Grinding Time, Hours | Grinding Rate, Tons per Hour | Grinding Cost, Dollars | | | | Kw. H. per Ton | Man-Hours per Ton |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Labor[1] | Power | Supplies | Total | | |
| 230 | 478 | 328 | 1.52 | $0.465 | $0.684 | $0.221 | $1.370 | 51 | 0.817 |
| 200 | 9150 | 4841 | 1.89 | .373 | .550 | .178 | 1.101 | 41 | .657 |
| 170 | 2786 | 1266 | 2.20 | .321 | .472 | .153 | .946 | 36 | .565 |
| 140 | 4409 | 1868 | 2.36 | .300 | .440 | .142 | .882 | 33 | .526 |
| 120 | 82 | 33 | 2.44 | .290 | .426 | .137 | .853 | 32 | .509 |
| 100 | 57 | 23 | 2.51 | .282 | .413 | .134 | .829 | 31 | .495 |
| 80 | 25 | 10 | 2.56 | .276 | .406 | .131 | .813 | 30 | .485 |
| 60 | 42 | 16 | 2.66 | .266 | .390 | .126 | .782 | 29 | .467 |
| 40 | 462 | 163 | 2.84 | .249 | .366 | .118 | .733 | 27 | .437 |
| 20 | 16597 | 5045 | 3.29 | .215 | .316 | .102 | .633 | 24 | .377 |
| Total..... | 34108 | 13593 | | | | | | | |
| Average..... | | | 2.51 | $0.282 | $0.414 | $0.134 | $0.831 | 33 | 0.527 |

[1]Includes workmen's compensation and public-liability insurance.

Fig. 12 shows the rated capacity of the Minpro plant and monthly shipments of ground spar since the formation of the company in July, 1923.

To consumers familiar only with the simple flow sheet of the average feldspar grinding plant, that of the Tennessee Mineral Products Corp. (Fig. 3) may seem unnecessarily expensive and complicated. Experience, however, has proved that every step in the process is necessary for the production of uniform products of known analysis. The special features of the plant are segregation of individual crude spars which is continued through intermediate storage, mining of spars on the basis of chemical analysis, and neutralization during continuous grinding to produce ground spars to meet the customer's specifications of analysis.

The growth of the company's business is testimony of the accuracy and efficiency of its production methods.

| Number of men employed | Rate per hour, cents |
|---|---|
| 1 watchman | 25 |
| 10 trammers of crude spar | 30 |
| 4 loaders and other labor | 30 |
| 2 mix rollers | 32.5 |
| 2 dryer operators | 32.5 |
| 3 separator operators | 35 |
| 1 tram foreman | 35 |
| 3 grinding-mill operators | 37.5 |
| 3 roll operators | 37.5 |
| 3 carpenters and repair men | 40 |
| 1 roll foreman | 50 |
| 1 mill foreman | 50 |
| 1 repair foreman | 55 |
| 1 teamster and team | 60 |
| 36 | |

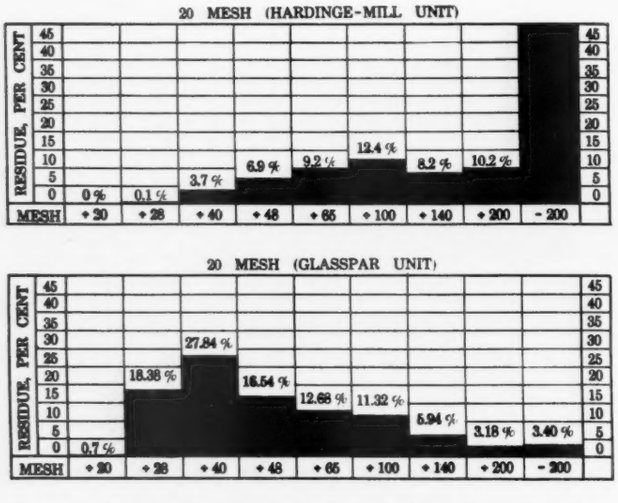



Fig. 11. Comparative screen analysis of 20-mesh product from conical mill and Glasspar units.

In addition to the above there are the mill superintendent, five men in the chemical laboratory, three office workers, and a scale man on a monthly salary basis.

The fine-grinding plant and separator sections of the Glasspar unit are run 24 hours per day. The other departments are run one or two 10-hour shifts, depending on business.

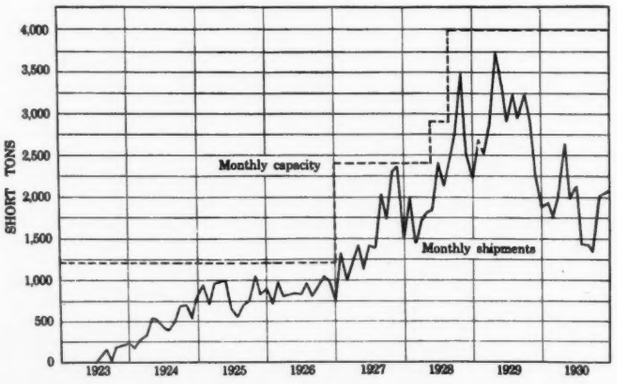



Fig. 12. Monthly capacity and shipments of ground feldspar.

A safety committee has been holding regular monthly meetings for the past two years. It is composed of the mine and mill superintendents, the scale man, timekeeper, repair foreman, office manager, chief chemist, and general manager.

Members of the committee alternate in making weekly inspections of the plant. Their reports are acted upon at the monthly meeting when each accident is discussed and remedial action taken. General meetings of all employees are held semi-annually and talks are given by committee members on safety and accident prevention.

A safety contest is being held monthly between the four departments. A prize is given at Christmas for the best safety suggestion submitted during the year.

Blast-hole drill and shovel at the Ocala lime-rock deposit at Haile, Fla.

# Plants in Georgia and Florida Produce Lime Rock for Highway Use

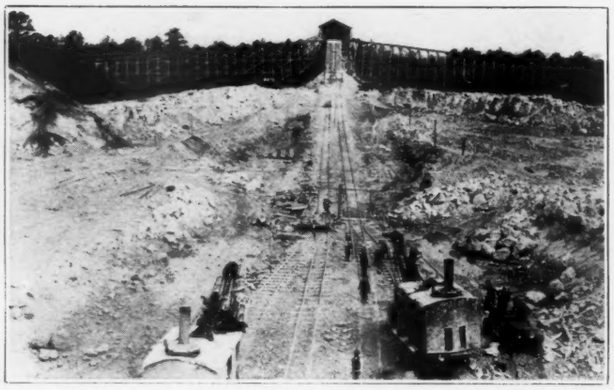
## High-Calcium Product Finds Increasing Favor for Semi-Permanent Construction

LIME-ROCK roads, which characterize the type so popular in Florida, Georgia, and other southern states continue to find favor despite the ever-increasing competition of other materials. In Georgia, along its numerous lime-rock roads which traverse the state, signs are erected calling to the attention of the tourist that "This is a Lime-Rock Road, a Georgia Product". Florida has already over 3,000 miles of this type of pavement in use, with many more miles planned for the future.

As a whole the present condition of the lime-rock industry is fairly encouraging. With the increased appropriations for state and federal highway construction as an offset for unemployment and the otherwise adverse business condition, the industry has taken an optimistic attitude. A large share of this year's work will include lime-rock material. Another favorable sign is in the fact that no less than five new plants have been erected in the Georgia and Florida district to furnish this material. In Florida the industry has long since passed its worst period of adversity—that which followed the Florida boom. During that latter period of less than two years, the bulk of the present system of highways was constructed, which created such an abnormal demand for materials that plants were opened up in wholesale quantities. In and about Williston, Fla., one of the state's largest producing centers, 17 plants were in operation during the boom; now less than half that number remain. As could be expected, the period following the boom was one of restoration to normal demand which simply meant that price competition and an almost total lack of demand forced a general reduction in the number of producing companies. Today, the principal Florida companies market their product through a single organization which has its headquarters at Ocala, Fla. Duplication of sales efforts with its resultant high costs are eliminated, and lime rock is produced and sold at prices which are consistent with sensible business methods. This organization operates entirely within state and federal anti-trust laws, and has been a boon to the industry.

Another source of betterment for the industry has been the development of improved road-con-

struction methods, and in the control of these methods through stricter and more scientific specifications. Numerous deposits have been abandoned since the specifications require a lime rock of not less than 97 per cent. $CaCO_3$—in the sedimentary form which characterizes this soft material. Likewise, the finished road no longer bears the high crown formerly thought necessary, and the base course today is of a thickness which prevents the unevenness which formerly gave it an unfavorable reputation with motorists. Likewise the newer



Perry plant of Georgia Lime Rock Co.

highways are being constructed on sub-bases which have received a general treatment on a par with that provided for the more expensive type pavements—with the resultant highways suitable for years of service. And in connection with this, it might be said that even though the early methods of construction resulted in rough and high-crowned roads, the binding feature of the lime-rock base partially redeems these mistakes in construction, in that the road can be torn up and the lime rock used over again because of its ability to re-bind without additional treatment.

Present specifications of both state and federal highway bodies call for a 20-ft. width with a base course of 11 in. of lime rock compacted to an 8-in. thickness. The surface treatment is usually one of two types, the stage type of construction or the finish type. In the stage type construction, a priming coat of hot-mix tar is given to the compacted lime-rock base. This is followed by a course aggregate, then a coating of asphalt and finally a course of fine aggregate. The aggregates used are usually slag or "Brooksville chats". This type of finished pavement usually costs between $10,000 and $15,000 per mile. The finish type of construction calls for the use of a 3-in. slab of asphalt or other type of prepared material such as Warrenite, Amiesite, etc. Every six

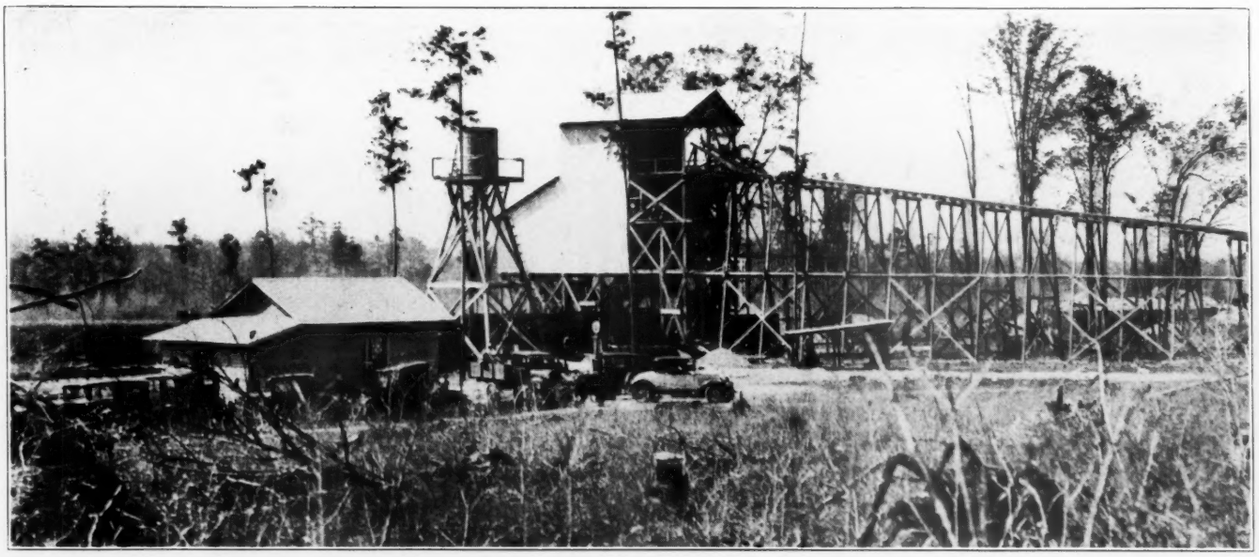
Loading lime rock at the Clinchfield plant.

years on an average, these roads are resurfaced with additional courses of slag and asphalt.

**Ocala Lime Rock Corp.**

One of the outstanding new plants in the lime-rock industry is the Haile, Fla., unit of the Ocala Lime Rock Corp. While the lime rock receives a most

The two inclines from the pit. Haile plant of Ocala Lime Rock Corp.



The new Clinchfield plant of the Georgia Lime Rock Corp.

simple processing—that of merely reducing it to 2½ in. and under by means of a roll crusher, the methods of mining and loading are strictly on a par with the latest and best. The plant is located on an 80 acre site. Two pits are in operation, each connected

Locomotives and cars used at the Perry plant.

with the plant by means of a double-track incline. A light overburden but 12 in. in depth is stripped with an Erie gas-air 1-cu.yd. dragline which loads the material into dump wagons. The latter are drawn by mule teams to a waste dump. Following the machine stripping, the exposed surface of the deposit is carefully cleared of stray clay, and any clay holes are cleaned out by hand.

A Keystone well-drill rig is used for the drilling operations at both pits. Six-inch holes are drilled to a depth of 40 ft. which is the working depth of the pits to their water level. From 12 to 14 holes are shot at one time using 30 per cent. nitro-glycerine in the form of 4-in. by 16-in. cartridges. A shot of this size produces about 4000 tons of lime rock.

The blasted rock is loaded by an Erie ⅞-cu.yd. steam shovel in one pit, and by an Erie ¾-cu.yd. steam shovel in the other pit into Ocala Iron Works 2½-cu.yd. cars. There are two cars to a pit. While one is being loaded, the other is drawn to the crusher hopper and dumped after which it returns by gravity to the shovel. Two Ocala Iron Works friction hoists draw the cars to and from the pit. The inclines at the Haile plant are approximately 350 ft. and 400 ft. long and their highest point at the crusher hopper is approximately 90 ft. above the pit level.

A single Pennsylvania 24-in. by 48-in. roll crusher, mounted directly above the car-loading track, crushes the lime rock to sizes below 2½ in., and the material falls directly to a hopper and

Stripping overburden into the dirt-handling machine.

thence into the railroad cars. This type of crusher—a single revolving roll equipped with heavy projecting teeth—is universally used in this industry as it does not readily choke up with the soft lime rock.

Power for the friction hoists and the crusher is furnished by two Bessemer semi-Diesel oil engines. These engines are of the horizontal type and are started by compressed air. They burn a low-grade distillate oil, usually a 32 gravity oil. Both engines are belted to a lineshaft, from which the power is distributed to the various mechanical units.

An innovation for this industry has been put to a profitable use in the Haile plant, of the Ocala Lime Rock Corp., that is, a water softener. A Wayne unit has been installed to soften the hard-water sup-

Car dumping into the crusher. Perry plant.

Primary roll crusher in operation at Perry plant.

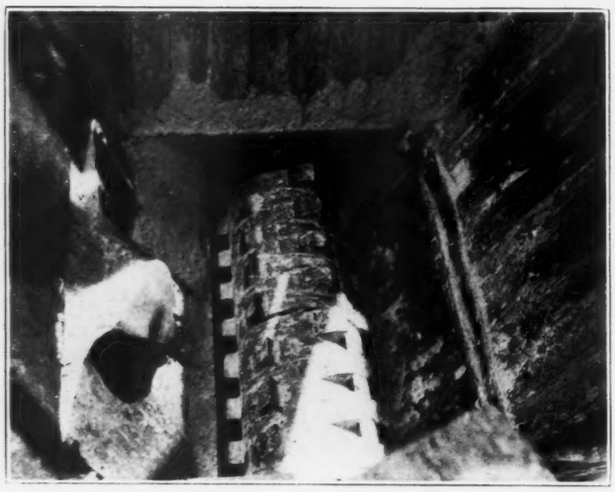
ply from a well pump. The softened water is then pumped to a 2000-gal. gravity tank from which it is distributed to the steam shovels in the pits. Since the softened water has been used in the boilers, boiler repairs have been reduced to a negligible amount.

The Haile, Fla., plant has an output of 40 cars of lime rock per day, the cars carrying an average of 55 tons each. The deposit's average analysis shows that it consists of a 99 per cent. $CaCO_3$ sedimentary shell rock. The Ocala Lime Rock Corp. also operates another plant located at Kendrick, Fla.

### Georgia Lime Rock Co.

In Georgia several new plants were erected during the past year. At Clinchfield, the Georgia Lime Rock Co. has only recently completed its second unit in that state. Here, the original crushing equipment consisted of a series of two roll crushers, one a 24-in. by 54-in. unit which served as a primary, and another roll crusher which served as a secondary unit. To relieve the crushers of fine lime rock, a grizzly was installed at the head of each crusher enabling this material to pass through directly to the car-loading hopper beneath. Not long after the plant was in operation the lime rock became of a character difficult to handle in a roll crusher because of its hardness. To cope with the harder rock, a Williams No. 7 Mammoth crusher was installed adjacent to the roll crushers, directly over the car-loading track. The Williams crusher, which is of the hammermill type, crushes the rock to specification in a single-step reduction. It is supplied with rock by means of a Stephens-Adamson apron feeder which has been installed between the receiving hopper and the crusher. A General Electric 250-hp. motor, direct-connected, powers the Williams crusher. The roll crushers have been retired from service but will remain in the building as standby units.

Plant of the Atlantic Lime Rock Co. at Sandersville, Ga.



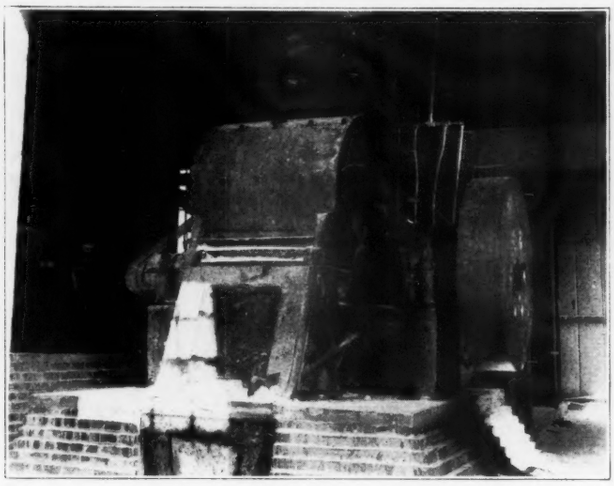
Roll crusher in the Perry plant.

In the pit, a Bucyrus-Erie 42-B shovel loads the blasted rock into Ocala Iron Works 3-cu.yd. cars which are drawn to the plant on a 260-ft. double-track incline. The new crushing unit has a rated capacity of 250 tons per hr.

The Georgia Lime Rock Co. plant No. 1 at Perry, Ga., is this company's original plant, having been built in 1927. In size, it ranks as one of the largest in the industry, having three active pits in operation with one double-track incline serving its center pit, and two single inclines serving the right and left wing pits. Stripping operations at the No. 1 plant are carried on with a P&H gas shovel with a

1-cu.yd. dipper. A Koehring Dumptor with a 7-cu. yd. body transports the waste material to a dump nearby. This machine, which is a twin-engine crawler-type truck-tractor, is capable of traveling over ground surfaces impossible for ordinary trucks or wagons.

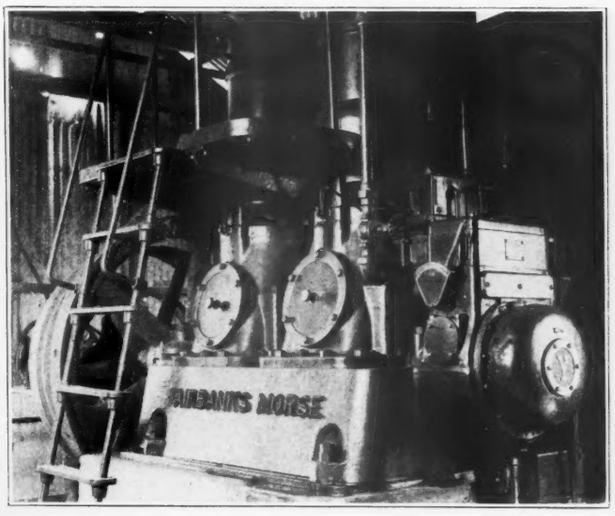
In the center pit the incline cars return by gravity to the shovel position. A short spur on each of the two center-pit tracks at the shovel positions allows the use of four cars, thus minimizing the periods of idleness of the shovels while waiting for the return of the empty cars. Operations in the wing pits are carried on at a considerable distance from the plant, necessitating the use of locomotives



Crushing equipment at the Sandersville plant.

to bring the cars to their respective inclines. The left wing pit track extends for a half mile from the foot of the incline. Two locomotives, one a Plymouth 8-ton and the other a Whitcomb 8-ton, haul trains of 5-cu.yd. side-dump cars between the shovel and the incline. In the right wing pit, 2 Plymouth locomotives, one a 7-ton unit and the other a 4-ton unit, do the intra-plant hauling.

The cars from all four inclines dump into a central hopper mounted above the primary crusher. This unit is Fairmount 48-in. by 60-in. roll crusher built by the Allis-Chalmers Mfg. Co. Here the lime



One of the Diesel engines used by Connell & Schultz at Williston.

rock is reduced to 6 in. and under, and the crushed material falls directly on a 6-ft. by 10-ft. grizzly with bars spaced so that all material 2 in. and under falls to the car-loading hopper beneath. All grizzly rejects pass to a No. 8 Williams Jumbo crusher which is direct-driven by a 250-hp. motor. From this crusher the material falls to a small car-loading hopper and then into cars beneath. The grizzly at this plant is given a gyrating motion by means of several eccentrics with 2-in. throws. The No. 1 plant of the Georgia Lime Rock Co. is electric-driven throughout. Its daily output is placed at 2500 tons. A complete description of this plant was published in the Aug. 14, 1929 issue of PIT AND QUARRY.

### Atlantic Lime Rock Corp.

Near Sandersville, Ga., a new lime-rock plant has been recently erected on property owned by the Georgia Portland Cement Corp. While complete in every detail, the plant is at present not in operation pending the outcome of state highway department tests on materials produced from its deposit. The equipment consists of a Thew shovel with a double-track incline to the plant. A Williams W2 Jumbo crusher reduces the lime rock in a single step to the

One of the Connell & Schultz plants at Williston, Fla.

Gasoline shovel in the pit at Williston plant.

required specification. This machine is fed by a Link-Belt apron conveyor and is direct-driven by means of a 200 hp. General Electric motor. A short belt conveyor sends the crushed material directly to the railroad cars.

**Connell & Schultz**

Three lime-rock plants are operated in Florida by Connell & Schultz whose main office is at Inverness, Fla. Two plants are operated near Williston, and the other at Lowell. The Williston operations are similar in size and character, the one being located on the Seaboard Railroad and the other on the Atlantic Coast Line.

Blasting methods employed at the Connell & Schultz operations are typical of those used in many lime-rock pits in this state. After the deposit has been stripped and hand cleaned of clay pockets, holes are drilled for the blasting by means of a length of ¾-in. pipe, the cutting end having been expanded and sharpened. Because of the softness of the rock, this tool has no difficulty in cutting its way through. These holes are drilled on 10-ft. by 10-ft. centers up to 12-ft. by 12-ft. centers, depending on the position of the shot. Before the blast is to take place (usually 10 or 12 holes) the holes are "sprung", that is, from two to six sticks of dynamite are dropped into each one and detonated, thus creating a large cavity at the bottom of the original hole. Then blasting powder, approximately 150 lb. per hole, is poured into each cavity for the actual blast. Cordeau-Bickford fuse is used to detonate it. The softness of the deposit requires an explosive of great lifting power rather than one of shattering power, hence the use of the blasting powder.

P&H excavator equipment is used in both the stripping operation as well as in loading at the plant located on the Seaboard railway, there being a ¾-cu.yd. dragline and a ¾-cu.yd. shovel. The pit at this plant has been recently opened, the older one on the north side of the plant having been depleted. A double-track incline with 4 Maddox Foundry & Machine Works cars drawn by a friction hoist of the same make serve to transport the lime rock to a roll crusher. The material is crushed in one step through the latter machine, then falling directly into cars beneath.

For power supply, both the Williston, Fla., plants use Fairbanks-Morse 80-hp. full Diesel engines. These engines burn a low-grade fuel oil and provide power transmitted through line-shafts to all the mechanical equipment.

## Lime-Chlorine in Sewage Treatment

(*Continued from page 25*)

of residual chlorine for long periods of time. Therefore, it is of importance in chlorinating sewages some distance head of the treatment plant for odor control, sewer protection or disinfection.

6. In stream and river improvement—such as the prevention of septic action or odor nuisances, for the elimination of slimelike biological growths in the stream, or for algae control—the lime-chlorine process should prove more efficient at less cost than ordinary chlorination.

7. The application of chlorine fixed as calcium hypochlorite removes the possibility of volatile chlorine being liberated during passage through the treatment plant and pump stations. Thus the hazard of corrosion of equipment and the disagreeableness of working at times in an atmosphere of chlorine are completely avoided. Consequently, the necessity for careful control of the chlorine is lessened.

8. Because of its non-corrosive nature, the calcium hypochlorite solution can be carried great distances through inexpensive pipe materials, thus reducing installation costs and resulting in greater flexibility of the chlorinating arrangements. If necessary, the solution can be stored in a tank for application at increased rates when required.

9. The lime emulsion from the lime machines may be diverted in part for other uses at sewage plants wherever required. Chemical precipitation and sludge alkalinization may thus be employed seasonally or intermittently where desirable and from the same equipment used in the lime-chlorine treatment.

10. The lime-chlorine process may be employed, where necessary, without the use of refined equipment, although this practice is not recommended except for temporary advantages or preliminary experimental purposes.

11. Smaller sewage-treatment plants can effectively use bleaching powder in place of lime and chlorine, thus reducing the cost of installing the process.

12. Sludge digestion may reasonably be expected to improve through the adoption of the lime-chlorine process, as is already evidenced in sewage plants employing prechlorination without lime. To what extent lime will improve the ordinary chlorine effect in this direction is speculative.

13. While ordinary chlorine does not show any pronounced effect in improving the efficiency of the activated sludge process in certain types of American plants, the use of bleaching powder in the same type of plant at Barnsley, England, is decidedly beneficial. It is hoped and believed that the lime-chlorine process will produce results similar to those from bleaching powder at the English plant.

14. In prechlorination, the alkalinizing effect of the lime used with the chlorine may be reasonably expected to produce a higher efficiency of clarification in the settling tanks, if not better separation of grease.

15. In chlorinating ahead of sewage tanks which have long periods of detention, or low efficiency of solids and oxygen demand reduction, the lime-chlorine process may again be reasonably expected to exceed ordinary chlorination in overall effectiveness.

16. Small quantities of the chlorinated lime water from the pipe line may be drawn for sprinkling around the sewage plant on screenings and at other places of fly-breeding and localized odor production.

The lime-chlorine process can undoubtedly be effectively applied to every city and town now treating sewage by any of the standard methods in use. Chlorine alone is considered an adjunct of practi-

(*Continued on page 62*)

# How Can We Stabilize Business If We Accept It at Any Price?*

By CHAS. F. ABBOTT
*Executive Director, American Institute of Steel Construction, Inc.*

BUSINESS in all lines has been bumping along on the bottom of one of the worst depressions we have ever gone through. We have been faced with the necessity of coping with a reduced volume of consumption and a radical reduction in prices. In intensity few previous depressions have been as severe, nor probably as protracted.

But we have always recovered and we have always benefited from these strained times. To bemoan the losses, or exaggerate the distress will contribute nothing toward the recovery. Man is a thinking human being. It is his capacity to reason things out that lifts him above the category of the animal. This is a time for an exercise of our God-given ability to think.

In a period like that we have been going through it seems difficult for some to recognize that operating policies in a factory must be based upon conditions of sale. They are too frequently formulated by disregarding those conditions.

Industry must understand and accept the theory of stabilized production. It must recognize the folly of attempting to operate a plant on a basis of 100 per cent. capacity output when statistics indicate a demand of but 50 per cent. of plant capacity. It must recognize the spirit of live and let live, and overcome that of selfishness which induces others to enter into a war of price cutting in an attempt to keep operating at like capacity. It must adopt the formula of total cost plus profit in fixing selling prices.

Is capacity production at a net loss more desirable than 60 per cent. or 80 per cent. output at a profit? If one competitor wastes his capital assets, must every other seller in competition match his destructive ignorant policy?

In a number of industries there has been severe trade depression. There we recognize inefficient methods that have obliterated all semblance of salesmanship. If the tendency in this direction continues at its present rate, it threatens to develop into trade prostration of the worst kind. The best hope of checking this trend lies in convincing sales executives that volume should not be the sole aim of business.

If Moses had given us eleven commandments instead of ten, the eleventh might well have been "Uphold the Sales Price." Short of downright dishonesty, there is nothing so unethical in business as cutting the price for the sake of getting an order.

Unless price cutting is stopped and prices are advanced to the point where they will show a reasonable profit, then wages must be reduced, increasing the volume of unemployment. Wage scales cannot be maintained and the unemployment problem cannot be solved unless profits can be realized.

If we stop to reason the matter out, eliminating all of the disturbing speculative element, would it not be possible that we would find that American business has slipped back into the jungle and must start all over again the slow process of evolution? The law of the jungle is that "might makes right" or its denizens with the sharpest teeth and the longest claws survive in the struggle for existence.

Whenever a seller becomes recognized by his competitors as a price cutter, his troubles begin. Whenever he submits competitive bids he becomes the target at which his competitors shoot their prices. The individual who relies upon price cutting as a means of obtaining his business becomes a marked man and his days are numbered. The life of a price cutter is not a pleasant one nor a long one. The trouble with the price cutter is that he spends all of his time trying to close the order. If he would devote as much time to convincing his prospect he would find that when he is convinced he closes himself.

There is no credit to anyone when an order is taken at a cut price. The buyer may gain a temporary benefit and the seller has the order, but in the end both buyer and seller lose far more than they gain. The buyer offers encouragement to price demoralization and he can never tell whether his price is right on his future purchases. The seller reduces his profit and in the end he may find himself giving away a part of his capital assets.

Nothing is so easy as to cut prices; and nothing is so hard as to get them back when once they have been pulled down. Any child can break an egg by throwing it on the floor, but all the learned scientists in the world cannot pick it up again. Any fool can cut prices, but it requires the combined power of the industry to put them back again.

There is only one way to make money in business. That way is to sell the product at a profit. The fact that there are many in every line who are making a profit proves that knowledge and self-restraint are not without their rewards.

It takes courage to look a large order square in the face and say "No" if it is not in accord with established terms and prices. Nevertheless, there are concerns in highly-competitive industries that are displaying that courage year in and year out. True, they may not have the big volume, but they have not been drowned in red ink.

Of course you cannot get all orders without price being the inducement in some cases, but there are

* An address delivered at the 1931 Convention of the National Lime Assn. at White Sulphur Springs, W. Va.

many other factors worth talking about. When the price is once submitted there should be no further concessions. That is salesmanship.

The whole structure of business is based upon profit and not upon the mere production or exchange of commodities. Business success demands exactness. The world is filled with men who guess, or assume, or are led to understand, that a certain figure is nearly, or approximately, or to all intents, accurate. But they are bossed by the man who knows.

There are many concerns without adequate cost systems and there are others who supplant their cost figures with a system of outguessing competition in computing their selling prices. A disregard of cost figures will eventually invite bankruptcy.

Business men can solve this problem to their own satisfaction and to their own financial success if they know accurately their costs and refuse to be bluffed into a sale at a price which will not cover those costs plus a fair profit.

When business men will give heed to the obvious way out of their difficulties they will be in a better position to plan intelligently. When industry holds fast to the fundamental law of profitable business it will become profit-minded, and that is a long way toward the goal of success. There is no substitute, however, for individual responsibility, and no hope of effective co-operation without it.

The market value of any business depends upon the amount and regularity of its profits. Real estate and inventories do not add much to market value. The real market value is determined by the efficiency of the whole organization and its profit-making ability. Bankers are searching day and night for the profit-makers and they run away very fast when the profit account is missing.

If demoralized price cutting is to be eliminated and the business transacted on a basis of profit, the manufacturer must exert his leadership, and in the formulation of his selling policy, he must define fair practices and then vigorously enforce them without any partiality or deviation. One of the most constructive influences is the establishment of a one-price policy, thereby establishing prices and discounts that will be fair to all.

While the law of supply and demand operates it is economically sound for the buyer to try to get the best possible price, but to drive the bargain below the line of a fair profit, good quality, and proper service, is poor business in the long run. Substitutions, inferior quality, and inadequate service logically follow. The buyer suffers and pays a much greater price in the end.

The buyer and the seller are as dependent upon each other as are the producer and distributor of the product. In the long run, buyer and seller alike will be adversely affected by any influence which undermines the stability of the other. The best assurances for the consistent prosperity and progress of both, and of American business as a whole, lies in active coöperation to foster constructive influences and stamp out those, such as price cutting, which are responsible for destructive competition and which menace the welfare of all concerned.

It is not the lawful reduction of prices that I condemn. We must recognize the ethical distinction between necessary price reductions and price cutting which is inspired by a selfish desire to obtain more than a reasonable proportion of business.

Prices that are reduced to dispose of excess inventories or to meet emergency conditions confronting a producer would not, and should not, be classified as illegal price cutting.

On the other hand, prices that are cut for the purpose of taking business away from others who may be entitled to it, is an objectionable form of price cutting. Under the spirit of the Clayton Act such practices, I firmly believe, are illegal. Cut prices to obtain more than one's share of business or to obtain business on a price basis alone is another form of price cutting that is reprehensible. To submit one price, only to return and submit three or four additional and lower prices, thereby starting a price cutting orgy, represents a vicious form of price cutting.

The Clayton Act plainly condemns price discriminations which are designed for the purpose of lessening competition. The idea behind the Federal Law is in line with what we all believe in, and I feel confident that we could cure the evils of price cutting today were we not likely to lose our way in the morass of legal technicality that so often follows when we depend entirely upon the courts to correct economic evils.

Reforms are difficult to realize when left to the compulsion of law and administration. Reform must exist in the hearts of men before it is really accomplished. Therefore no statute will ever cure business men of the evils of price cutting until business men cure themselves individually of all desire to indulge in evil practices. We must convince ourselves of the desirability of the right before we can attain it.

Every now and then someone bobs up announcing a newly-discovered plan to relieve some industry of all of its difficulties. Meetings are held and the plan is launched amidst great enthusiasm. But the first stop of the joy ride is usually at the office of the Department of Justice in Washington. As far as I know no one has as yet ever devised a legal plan to get around the Anti-Trust Laws and do things that the laws specifically state must not be done.

Most men will agree that prices are lower, that profits have become impaired and that competition is more difficult to meet. It is a strange phenomenon in some as they are left hopelessly struggling for a solution and relief from the perplexing difficulties with which business has become inflicted.

The Anti-Trust Laws, with some of their now obsolete interpretations and many doubtful regulations under them, are probably responsible for some of the business man's worries. A modification of these laws with intelligent interpretations would undoubtedly offer relief; but by no means are they alone responsible for the new conditions now confronting our business activities, nor would their repeal remove the principal present day problems.

The argument for such a revision is valid in itself for the Anti-Trust Laws were enacted to prevent restraint of trade rather than to forbid all trade agreements. Therefore trade agreements which have for their purpose the conservation of a product for the best interest of the public or the saving of an industry would not necessarily come under the prohibition of the intent of the framers of the statutes. It is becoming more and more apparent that production in important fields has outgrown many of the rulings under the Anti-Trust Laws.

While modifications are undoubtedly necessary, it is well to remember that extreme selfishness on the part of some at a disregard of the rights of others represents a principal evil. Until individual selfishness can give way to justice and fairness with the spirit of the industry of paramount importance, we cannot expect any relief even though the laws might be modified. It is only through honest cooperation that enlightened selfishness can possibly dissipate ignorant competition which is the real hazard.

The cause of price cutting is to be found in the mental qualities of the cutter. Ignorance, misunderstandings, confusion, greed, distrust and antagonism are the destructive elements. The solution of the problem involves the curing or elimination of these qualities. Failure to do so means continued unprofitable operation.

Who is to blame for price demoralization in an industry? Is it the salesmen or their superiors? In my opinion the criticism that has been levied against the salesmen during the past two years has been unjust. They have too frequently been instructed by their superiors to obtain volume without regard to price and reluctantly followed instructions. Salesmen as a rule have been trained to think in terms of profits and that is the principal incentive upon which sound salesmanship is based.

Our only legal cure of the evil is education. By hammering indisputable facts home again and again to every member of an industry the influences that promote price cutting can be reversed.

Education should start by destroying the illusion that greater profits can be obtained from an increase in volume secured by price cutting. When this illusion has been destroyed the root of the price cutting evil will be eliminated.

We can do much to effect this education through coöperation, through coming together and honestly discussing our problems. Around a conference table, in trade association meetings, this education is possible, and without circumscribing the rights of individuals.

The idea of compulsion does not sit well with an American, and I venture to say that should we have such a law as exists in some other important commercial nations compelling membership in trade associations we might lose some of the vital force in our present system of industrial coöperation. Voluntary adhesion to a trade agreement is far more effective. But that does not blind us to the fact that the greatest weakness at present in our trade association movement is the inability of obtaining the membership of all who are profiting from the fruits of the coöperative. There are, even in times less depressing than the present, certain non-members who prefer to ride free. They take their profit from improvements in industries effected through trade associations without being willing to stand their part of the expenses.

When business is depressed through agencies outside the control of trade associations the need for greater cohesion within the industry is even more essential. Especially is this true in the financing of trade associations if predicated upon a volume tax on the production, as is nearly always the case. During the past year most trade associations have been forced to exercise economy without regard to the importance of the work they were engaged upon. And yet present conditions call for organized, intelligent industrial leadership which is possible only through the trade organization.

Industrial associations are not only essential in promoting progress, but they are a necessary benefit to members, to customers and to the public. Most of the problems that confront the individual business man are shared equally with his competitors, his customers and his public. He cannot solve them alone. Success will depend upon the coöperation of all interests involved.

Trade organizations can be no greater, no stronger than the members who respect them and give them their confidence. They are as impotent as those who scoff at humanity's weakness. We cannot bring back by wishing, or by mandates against normal economic law a business that was constructed on unsound, inefficient principles, or avaricious individualism.

Every industry has its problems, some basically economic, others more specifically related to production or selling, that can be overcome more effectively by coöperation than by any individual action. The individual concern unaided cannot cope with this modern day struggle for markets. The forces that are marshalled against it are too great. The battle-line is too far-flung. The vision to see that the individual concern can prosper only as the industry prospers, offers the sole hope of survival.

Such coöperative activity, aimed primarily at better merchandising methods, offers the one assurance of prosperity. During this period of stress the problem is to locate buyers to absorb what we produce, to make them want what we have for sale.

Is management really conversant with all of the facts that would enable it fully to appraise the benefits that could be expected from a trade organization? I doubt it.

The attention and interest of management has been confined largely to their own individual problems without sufficient thought to the work being accomplished by their trade association. They are too prone to look upon membership as a contribution to their industry instead of an investment from which they should insist upon returns.

Proper appraisal would develop very definite benefits—cost reductions, new opportunities and other factors that should impress any fair minded executive that a properly organized trade association is

essential to the future of his own organization.

Many conventions have been held throughout the country during the past two years at which the question of prices and profits has been thoroughly discussed. The way open for improvement has been hammered home time and again. Nearly every member of an industry attending these conferences and conventions will agree with the soundness of the recommendations submitted, but leadership seems to be lacking.

One of the highest purposes of an organization is to establish the confidence upon which honesty is based. Without honesty there can be no agreements. Honesty can be established as relationships increase, and confidence will replace suspicion. It is a hopeless task to place too great reliance upon mutual agreements until honesty becomes a part of man's character.

Organized coöperation, supporting a well-developed practical program, opens the way for important accomplishments that would advance the industry and promote individual success and public welfare. Research to develop new uses, new markets, and reduce costs, advertising, education, and many similar activities can be economically and more effectively promoted than would be possible if entrusted to individual action.

There should be no doubt, no hesitation, in the acceptance and application of wholesome coöperative effort among competitors. It offers the only way to a larger business, a better business and satisfactory profits. There is no other answer. Either competition will fall to the level of vicious fighting and trade demoralization, or it must adopt a practical plan of coöperation. Men working together sincerely for a common end and a common purpose can so organize their energies that problems fade before them and limitations recede. It is then that the individual prospers the most.

The industrial and commercial contest of the next twenty years will be cyclonic in its intensity. It will be vast and magnificent. Sales managers are just beginning to realize that business is in its dawn, and that victories of the past are small in comparison with the victories of the future. Just as the master word of yesterday was "Initiative"—so the word of today is "Coöperation," and the word of tomorrow "Coördination."

Without the trade association there is no assurance whatever of a normal stability of an industry. An instance so small as the releasing of a destructive cut-price policy usually inspired by some imaginary grievance and by a single company will kindle the flames of bitter retaliation and all the evil consequences of greeds, animosities, hates and jealousies.

A well-organized trade association offers the sole hope of preventing impulsive acts. The appeal to justice and fairness usually succeeds in quieting the vicious thoughts that flash in the heat of temper.

The lesson of coöperation as advocated by the trade organization has prevented many a costly price war that otherwise would have proved expensive and disastrous for the entire industry.

The constructive moral influence of the trade association, its respected leadership and its stabilizing qualities all go to create a force of second appeal for calm, patient and fair consideration as substitutes for the rash deeds of temper that otherwise must find some outlet to soothe the mind of the one who thought himself the victim.

If there was ever a time when the trade associations should receive united moral and financial support it is during periods of distress. It is then that the combined energies of an industry should be set in motion and move forward aggressively. It is no time to retire or withhold support, and those who do are actually the ones who are preventing the progress that they, themselves, are most concerned in.

Business revival always awaits leadership. Problems of an economic nature are so complex that industry must recognize its full responsibility, chart the course and supply the pilots. No harbor is ever reached by merely drifting. We cannot depend upon success that places reliance upon chance, guesswork or assumptions, and we must not hesitate.

The challenge to industry today is whether we are going to meet the issue and solve it effectively, or whether we are going to invite the Government to do it for us. You have witnessed what happened in Italy. Extreme individualism in industry and trade has been replaced by a state dictator. Russia is doing the same, only through a differing political method.

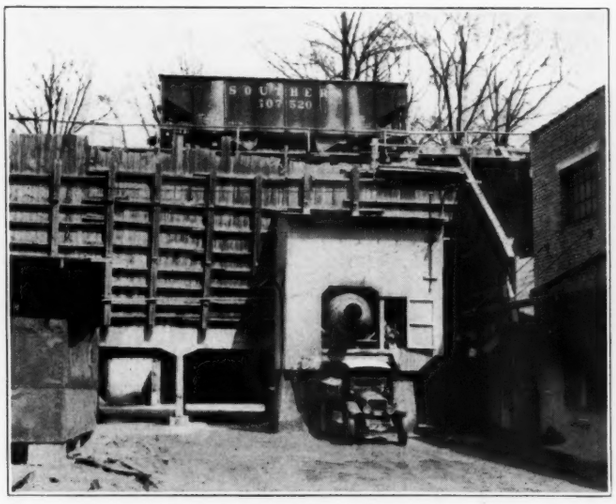
The people of the United States have declared for a democracy, and American industry is confronted with the serious necessity of proving that these economic emergencies can be successfully coped with under a democracy, that these business problems can be solved through coöperative effort and without recourse to governmental interference. This is certainly a time when we should be willing to submerge our willful desires, our selfish ambitions for the betterment of our industries and trades and thus prove our ability to coöperate for progress.

We have this challenge thrown at us by Mussolini and by Stalin. Are we going to acknowledge that our democratic principles are wrong? I think not, for we have learned how to coöperate. The trade associations have demonstrated effectively the power of organized coöperation.

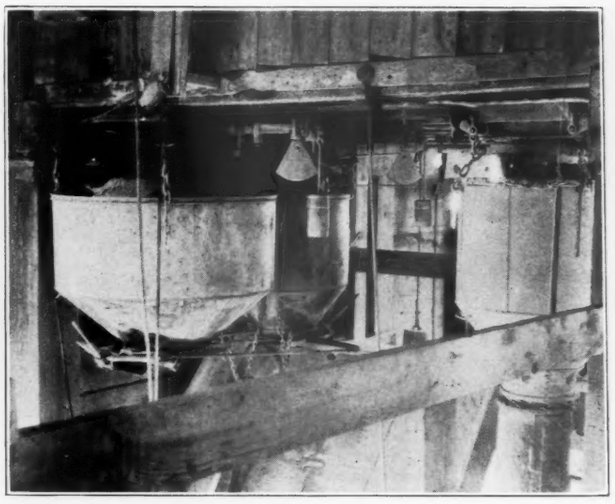
---

## Barite Deposit in Arkansas May Be of Commercial Importance

Interest is reported in an occurrence of heavy, dark-gray, fine grained, loose surface rock in Hot Spring county, Arkansas, long known to local residents as an impure barite. A test shaft was sunk to a depth of 28 feet, last winter and, except for the first two and a half feet, penetrated bedded impure barite, indicating that the deposit is probably one of some size. Bryan Parks of the Arkansas Geological Survey is preparing a report on the deposit, with a geological map of the area.



The concrete plant with railroad trestle above.



Measuring hoppers with discharge chutes below.

# Elevated Tracks Allow Rapid Unloading of Material to Concrete Plant

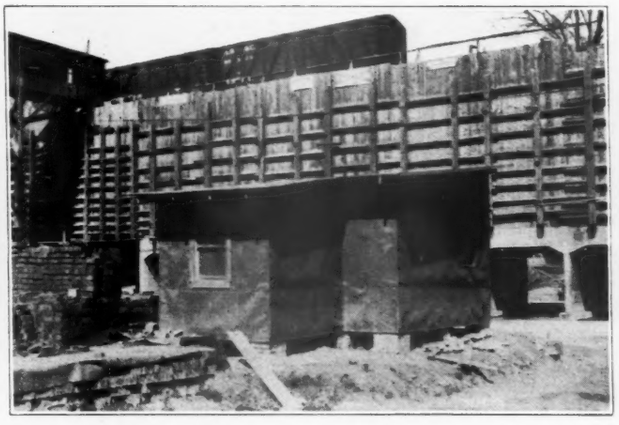
## Skip Raises Aggregates and Cement from Lower Level to Mixer Over Loading Lane

WITH the advent of ready-mixed concrete, the Atlanta Aggregates Co. of Atlanta, Ga., took advantage of its ideal location to extend its business. The Southern Ry., which has a line passing through the company's property, serves numerous industries in the northeastern section of Atlanta. The tracks at the plant of the Atlanta Aggregates Co. are located on a fill approximately 40 ft. above the normal ground level. For years this high track has allowed the easy handling of incoming cars of aggregates, bins having been built beneath the tracks to store the materials from which trucks are subsequently loaded at the ground level.

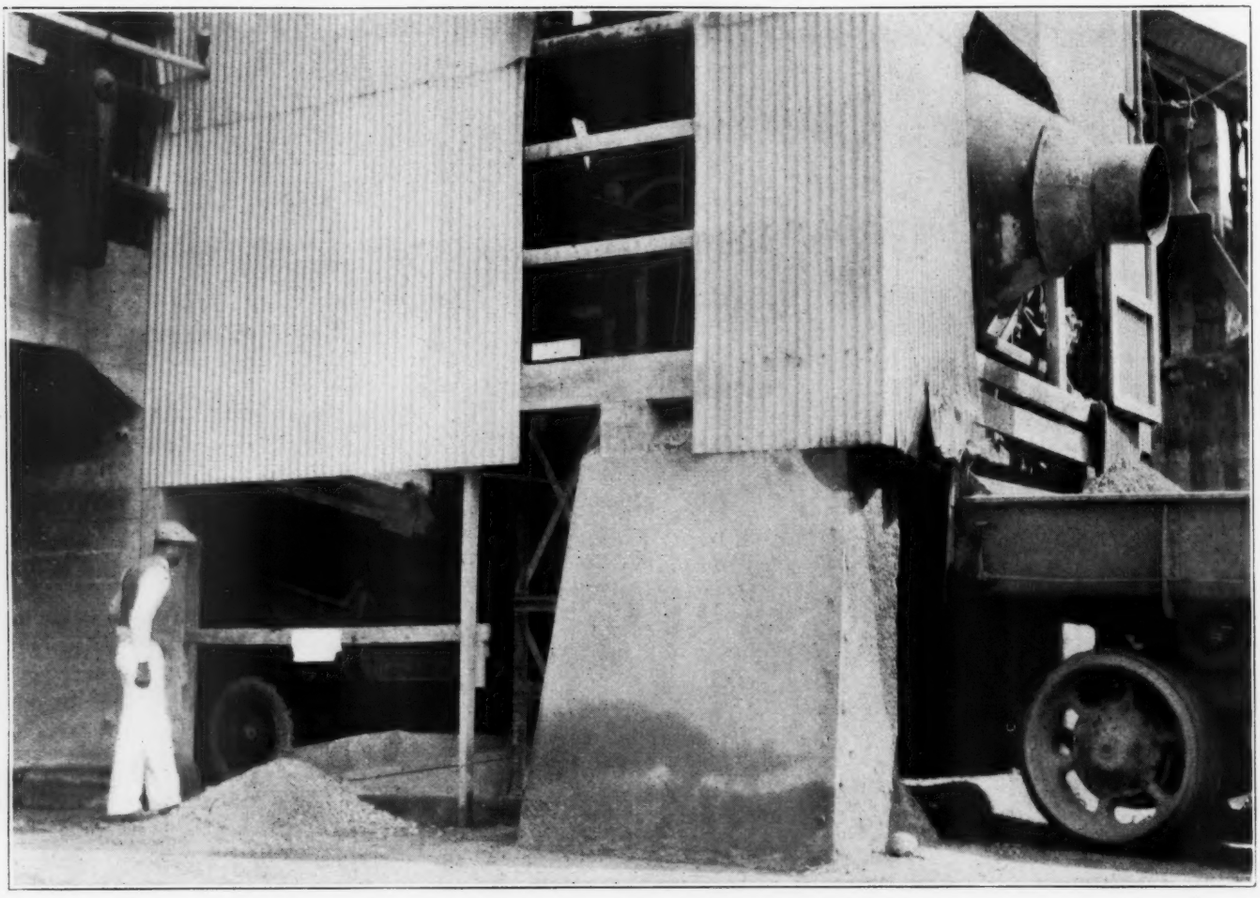
There are twelve bins in the series, each of which has a capacity of three car-loads of materials. Three bins are used for sand, three for gravel, three for slag, and one each for stone, cement, and reserve. One sand bin and one slag bin serve the ready-mixed-concrete plant, with a cement bin of 1½-car-load capacity adjacent to them.

In designing a ready-mixed-concrete plant to utilize the present bin system, it was necessary to resort to the use of a skip-type mixer. The weighing hoppers of the bins, which extend to within 15 ft. of the ground, are far too low for direct discharge into a mixer which is intended to dump into the delivery trucks. The 1-cu. yd. mixer, a T. L. Smith Co. unit, was installed at the required height for tilting-discharge into the trucks. To deliver the batched materials into the mixer drum, a special skip and guides were designed and built by the Smith company. This allows the skip to be loaded at ground level and then raised to a height of 12 ft. to the dumping position.

Storage building for sacked cement.



Testing laboratory at the plant.



The mixer building. Truck ready to be loaded at right. The skip is partly visible through the open panel.

Materials are weighed in C. S. Johnson Co. Model 28 measuring hoppers, the sand unit having a capacity of 19 cu. ft., the coarse aggregate unit, 27 cu. ft., and the cement unit 8 bags of cement. The aggregate hoppers discharge to a chute which, in turn, discharges into the mixer skip. Normally, a 1¼-in. slag is used for a coarse aggregate. Should gravel or stone be required, this material is brought by truck from the other bins and dumped direct into the skip. The weighing hoppers are built high enough to allow trucks to back under them for access to the skip. The chute is raised out of the trucks' way by means of a small winch.

The T. L. Smith mixer is timed by a Koehring Batchmeter, and water is furnished by a T. L. Smith 37-gal. automatic measuring tank mounted above the mixer.

Open-body trucks have been employed for the delivery of the mixed concrete. The fleet consists of eight trucks, all standard-make machines. These have standard dump bodies with the exception of one Hug Roadbuilder which has a specially designed 2-cu. yd.-capacity body. Celite and Vaso are mixed with the concrete when admixtures are required.

A newly-erected building near the mixing plant will house a laboratory of the Pittsburgh Testing Laboratories. Representative cylinders will be made for each concrete job to insure the maintenance of strength and quality standards. Special concrete mixes will be designed by the Pittsburgh Testing Laboratory engineers who will act as consultants on all concrete problems.

Some of the principal users of Atlanta Aggregates Co. ready-mixed concrete include the Georgia Power Co., which furnishes the Atlanta district with light and power, and the city of Atlanta for its sidewalk, gutter and sewer work. Officials of the Atlanta Aggregates Co. are: W. M. Center, president; J. A. Glazier, treasurer; and S. G. Compton, secretary. Fred Saunders is plant superintendent.

## Bauxite Produced in 1930 Valued at Nearly Two Million Dollars

Shipments of bauxite from mines in the United States in 1930 were 330,612 long tons, valued at $1,928,297, a decrease of 10 per cent. in quantity and of 15 per cent. in total value, as compared with 1929, according to a statement of the United States Bureau of Mines, Department of Commerce. Bauxite was produced largely in Arkansas at four mines—the Sweet Home and Dixie No. 2, in Pulaski County, and the Bauxite and Superior mines, in Saline County. Shipments of bauxite from Arkansas in 1930 were 315,273 long tons, a decrease of 10 per cent. from 1929. The main production originated in the Saline County field, in which there was a decrease of 5 per cent.

# The Development and Operations of the Canadian Asbestos Industry*

By B. MARCUSE

*President and General Manager, Canadian Asbestos Co.*

AMONG the early French settlers in the Province of Quebec, asbestos was called *pierre à coton* (the cotton stone). This name was used because the stone appeared to them as a stone of cotton, and in some respects these early settlers were right.

The appearance and quality of asbestos justify in many ways the nickname given to it by the inhabitants, because, while it looks like stone, it can be woven like cotton and wool, and, in its natural state, it even looks like spun glass. It is smooth and silky to the touch, and possesses at the same time great tensile strength.

B. Marcuse.

Occupying the position of a connecting link between the animal, vegetable and mineral kingdoms, it possesses some of the characteristics of all three. While in appearance as light, buoyant and feathery as thistledown, it is, in its crude state, as dense and heavy as the solid rock in which it is found. Seemingly as perishable as glass, it is yet older than any order of animal or vegetable life on earth. So little, indeed, is it affected by the dissolving influences of time that the action of innumerable centuries, by which the hardest rocks known to geologists are worn away, has had no perceptible effect on the asbestos found embedded in them. While the greater portion of its bulk is composed of the roughest and most gritty materials known, it is really as smooth to the touch as soap or oil. Apparently as combustible as tow, the fiercest heat can not consume it, and no combination of acids will affect the appearance and strength of its fiber, even after days of exposure to their actions.

It is not affected by heat, cold or dampness. It possesses two properties which are not found combined in any other substance. It is textile and it is incombustible. It is a perfect non-conductor of electricity. Hundreds of millins of dollars have been invested throughout the world in mining and manufacturing it. Over $10,000,000 in value of the raw material alone is exported from the Province of Quebec every year and, when it is remembered that less than a century ago asbestos was practically unknown, it is not unreasonable to assume that within the next hundred years the asbestos industry will make still greater strides and become one of the most important industries.

The name asbestos is derived from the Greek, and signifies unquenchable or unconsumable. The early Romans obtained their supplies of asbestos from the Italian Alps and from the Ural mountains in Russia.

When asbestos was first discovered it was considered to be of vegetable origin, probably because of its silky appearance and unctuous feel. Specimens of woven asbestos made in the days of the Romans are on exhibit at the Vatican, and these specimens contain a certain percentage of vegetable fiber intermixed with the raw asbestos. The same practice is still carried on nowadays by adding cotton, although the finer grades of asbestos, known as chemically pure grades, are made of the pure crude asbestos, showing that it is not necessary to add anything to the mineral.

When Marco Polo was traveling through Siberia in the thirteenth century he was shown some cloth which resisted the action of fire, and he found that it was made of a fibrous material called Amianthus. This material probably came from the Island of Cyprus. The word Amianthus is really a translation for asbestos.

Aerial view of the town of Thetford Mines, showing the asbestos workings.

* Reprinted in part from the *Canadian Geographical Journal*, i. 6.

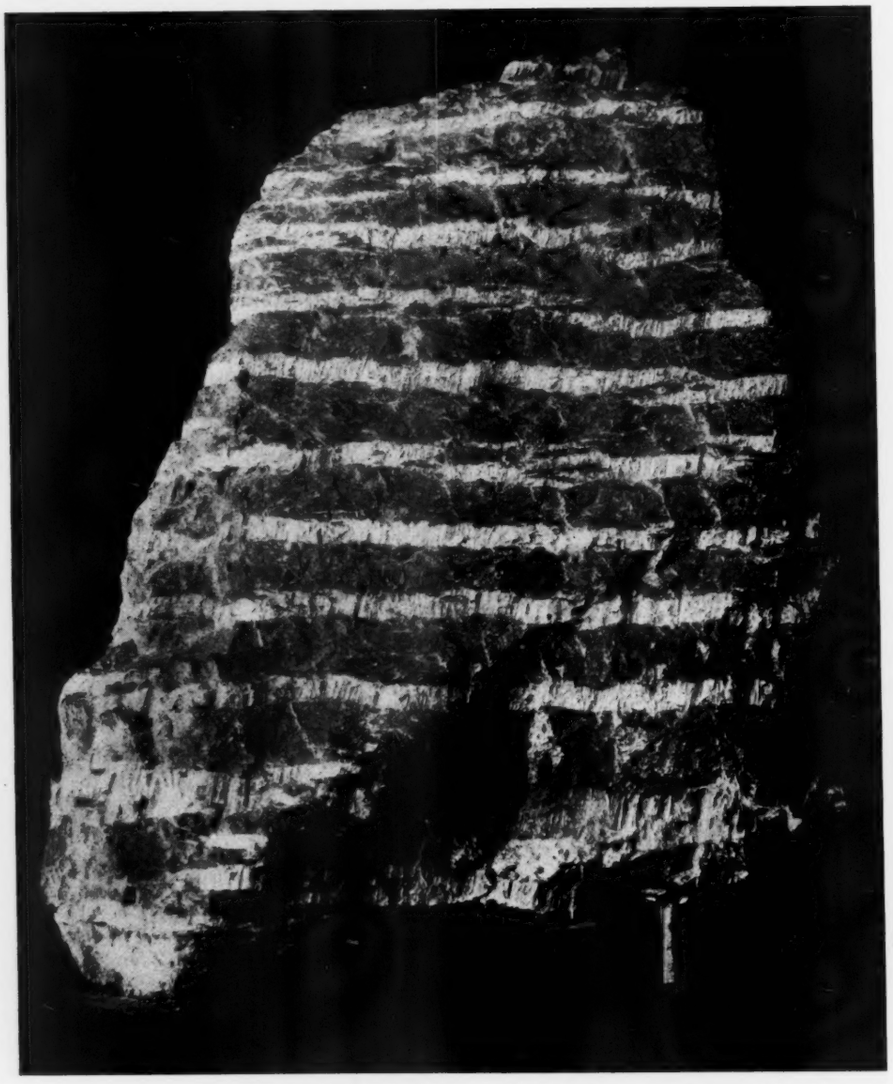
Crude asbestos of the finest grade. The fibers are easily discernible.

The early history of asbestos states that Charlemagne used table cloths made of asbestos, and to amuse his guests threw them into the open fireplace and afterwards took them out, thereby mystifying his company through the fact that they had not been destroyed.

From this early history it is apparent that this peculiar non-combustible and spinnable material was recognized as having some value, and, whereas early attempts to use asbestos commercially were made from time to time, it was not until the middle of the nineteenth century that asbestos came into its own. Since then the exploitation and development of mechanical methods for preparing this product of inorganic nature have gone ahead apace.

Various kinds of asbestos are found. Each country in which it is found produces a different variety. However, the two most important classes are known as chrysotile and amphibole, the first-mentioned having considerable tensile strength and being therefore adapted for textile purposes, whereas most grades of amphibole can not be spun. As stated, asbestos is never precisely alike in any two places. This is best illustrated by the collection on exhibit in the author's office, consisting of more than 500 different specimens. Then again, the color varies; it is found in all shades and hues, in all lengths, and changes from the early Mountain Leather and Crystals to the finer silky threads which can be spun into yarns which weigh less than an ounce per 750 ft., and possess great tensile strength.

Many people wonder just how the fibers are separated so that the various lengths are brought together. A technical book would be required to go into these details, but in a few words it might be stated that the entire process



Specimen showing ribbon structure of asbestos rock.

is a mechanical one and that the main operation takes place in machines known as collectors and graders. Asbestos is sold by the ton, and the price is based on the length of the fiber; therefore, a machine had to be devised whereby the producer could test his fibers and whereby the buyer would know he was getting the correct grade or quality; consequently, a shaking machine was invented. This machine consists of four boxes on top of one another; each box has a different screen with a different mesh and gauge. One pound of the asbestos fiber is placed in the top box and the machine is allowed to run for 2 min. at 300 r.p.m. A ¾ eccentric gives the machine a shaking motion. After the machine has run for 2 min., it is opened and the residue on each screen at the bottom of each box is weighed. The more fiber found in the top or first box where the screen is widest, the better and more valuable the grade, and this process is continued until such grades as only show a residue in the bottom and second box are obtained and sold as the lower grades.

View of the deposit at the Bell mines showing the serpentine asbestos veins.

The combination of figures obtained on each box added together will always give the sum of 16 oz., so that what is commonly known as spinning fiber might test 4 oz. on the first box, 7 on the second box, 4 oz. on the third box and 1 oz. on the bottom, whereas a short fiber tests nothing on the first and second box, 5 oz. on the third, and 11 oz. on the bottom box. Other combinations always total 16 oz.

Asbestos is widely distributed and found in many countries, but, as already stated, every country produces a different type or kind. Some of the most important countries, outside Canada, in which asbestos is found, are Rhodesia and Cape Colony in South Africa, Russia, Vermont and Arizona in the United States, the Island of Cyprus, Corsica, Australia, the Italian Alps, Finland and South America. However, asbestos is not found in commercial quantities except in a few places.

To-day the finer grades of asbestos are used for making asbestos textiles. These textiles are again turned into various articles of commerce.

Face of the deposit of the Quebec Asbestos Corp. at East Broughton.

Drillers at work preparatory to a blast.

Probably the largest use for asbestos is for making yarns for brake-band lining. Every motor car is equipped with asbestos brake-lining. The best brake-lining for automobiles is made of the long grades of Canadian fibers and crudes. One can not visit a theater without seeing an asbestos theater curtain. Asbestos is used for filtering acids, insulation, such as boiler and pipe covering, fire-proofing, packings, millboard and asbestos paper. Asbestos-roofing manufacturers and the paint trades use it to a large extent as a base. Artificial floors are sometimes made of it.

Asbestos is also used for acoustical plaster; brake-bands for wheels and disks; boards; boiler coverings; boots; brushes for corrosive liquids; fireproof clothing; cork and asbestos mixtures; covering for radiators; corrugated paper and sheets; door-sills and frames; electrical insulation; switchboards and boxes; handles; cords; cables; covering for wires; vulcanized materials; felt and wool covering; filters; fire-extinguishing mixtures; flat-irons (handles and stands); heating plates; floors; insulation in film industries; insulating material for boilers and steam pipes; insulation for refrigerators; lining for furnaces (in factories and homes, drying-rooms, baking ovens); magnesia-pipe insulation; mattresses; packing material (counteracting chemical agents, dry and wet heat, high-pressure steam, for pumps, air brakes, etc.); painting materials and colors; paper; paste and cement for building material; plaster for walls and ceilings; road-building material; roofing materials (slate and tiles); sound-proofing material; textiles (clothing, draperies, covers, rugs, tablecloths, etc., tarpaulins, theatrical decorations, mats, belts); wall hangings; wall-paper; water-proofing with impregnated asbestos; wicks and torches; artificial wood.

The first discovery in Canada was made in the early 'sixties of the last century when a deposit of silky-fibered stone, so-called, was found in the Province of Quebec. A sample of this was sent to London for exhibition purposes, and later on other vast deposits were discovered from which Thetford, Black Lake and Asbestos, near Danville, developed. These now constitute the world's greatest reserves of chrysotile asbestos. Mining operations were started in the Province of Quebec around 1878, but at that time only the better grades of crude were used. To-day, however, all grades are used, and the bulk of the production in the Province of Quebec is what is known as fibers of the grades used for shingle and paper-making, besides which, of course, the better grades for spinning and the lower grades for insulation are also found.

On a map of the Province of Quebec one will see

Loading the holes before a blast.

After a blast. Note the unusually large breakage.

the names of Danville, Asbestos, Black Lake, Thetford Mines and East Broughton. At and near these places are all the asbestos mines of the region. The busy little towns, in and around which there are a number of mines, are peculiarly asbestos-mining towns. They owe practically their whole existence and their population to the presence of the mines.

The asbestos region of Quebec may be really divided into three areas: the Danville district, where the Canadian Johns-Manville Corp. has opened a vast deposit; the Thetford and Black Lake district, where companies such as the Asbestos Corp., Bell Asbestos Mines, and the Johnson Co. are situated; and the East Broughton district, where the Quebec Asbestos Corp. is the chief operator. Queer to relate, each district produces a different class of asbestos. Danville is known as a milling district, and less crude asbestos is found there than at Thetford. Thetford is recognized as being the district from which the finest crudes and spinning fibers in the world are obtained, and at Broughtons the better class of the shorter grades is produced. Black Lake is known for its shingle stock.

The properties of the Canadian Johns-Manville Corp. are situated at the village of Asbestos, five miles from Danville. Crude asbestos was first removed from the present mine of the company in 1887. It was originally called the Jeffery Asbestos Mine, as it was located by W. H. Jeffery. Upon the death of Mr. Jeffery in 1894, the property was bequeathed to William Farwell and Frank C. Thompson, who sold it in 1895 to Messrs. Boas, Greenshields & Marcuse (the last-named being father of the author). These men organized the Danville Asbestos & Slate Co., which was bought out in 1897 by the Asbestos & Asbestic Co., Ltd. The latter company went into liquidation in 1916, and was purchased by the Manville Asbestos Co.

In 1918, the Manville company transferred all properties to the Canadian Johns-Manville Co., Ltd. This property has since been greatly developed and now forms the largest single source of supply for commercial asbestos in the world. What

Quarry of the Asbestos Corp., Ltd., at Thetford Mines.

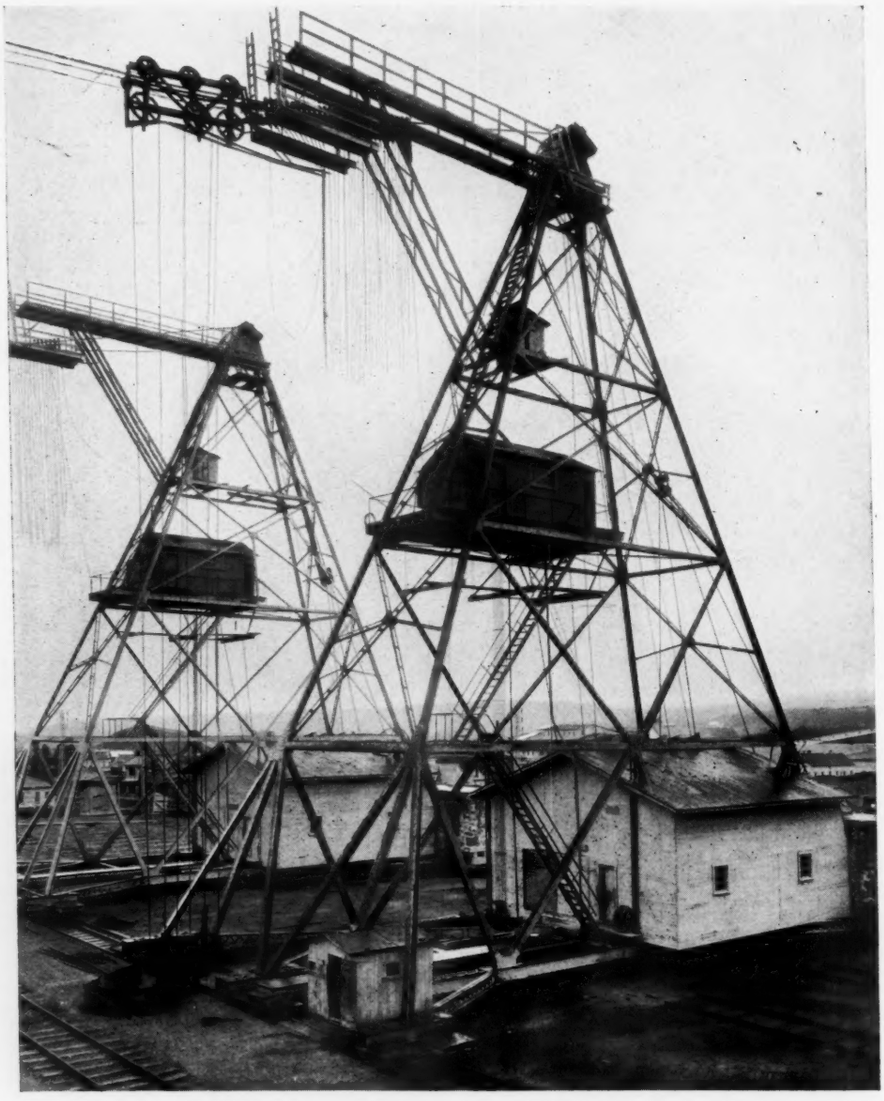
Electric shovel loading cars at the Canadian Johns-Manville quarry.

was formerly a comparatively small hole in the ground is to-day a vast pit, 50 acres in area. One sees a tremendous hole in the ground, but what a hole! In it is being waged a mighty and continuous battle with Nature to wrest the fiber-bearing rock from her stubborn grip. Here we have great electric shovels, older craft in the form of huge steam shovels, while gasoline-powered shovels are used for lighter duty.

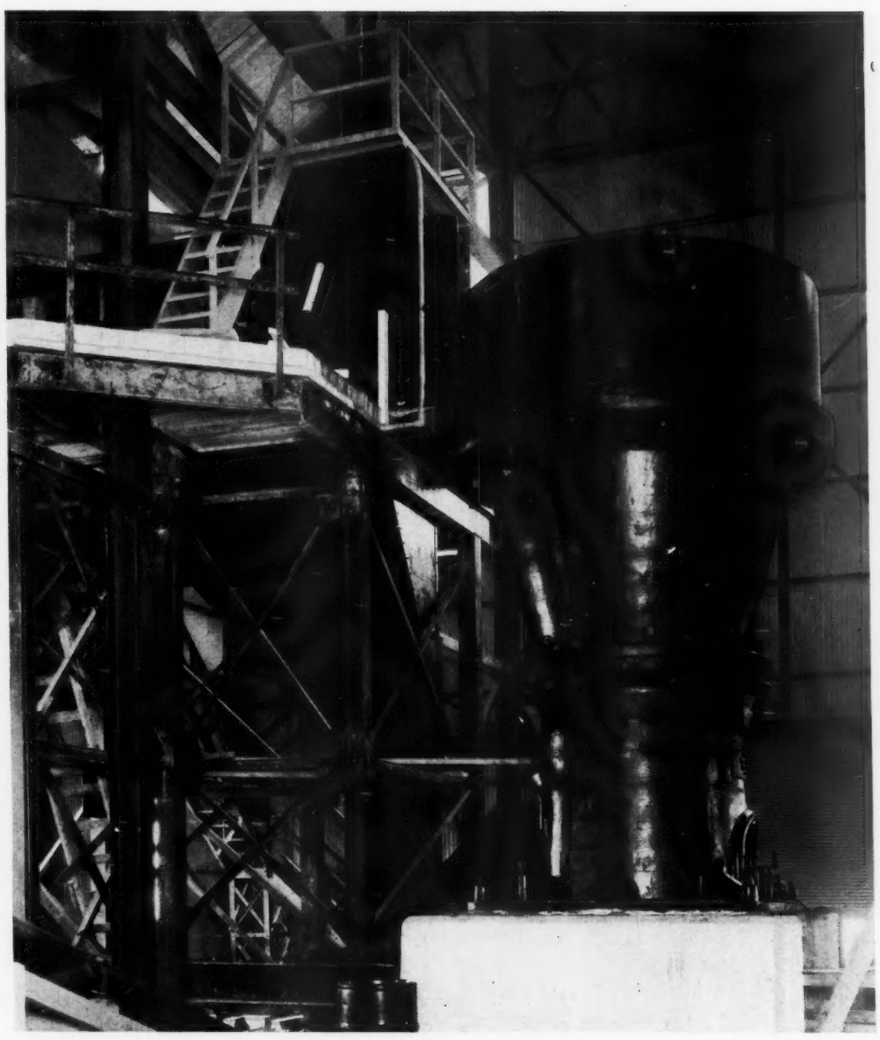
Auxiliary equipment includes electric locomotives, steam locomotives, dump cars, service cars, box cars, telephones, signals, power lines, air lines, water lines and batteries of searchlights. At night, the bowl of the pit is illuminated by powerful electric lights and the loading out of materials proceeds as in the daytime—dirt and waste rock to the dumps, ore to the mills. At times it is a battle with the elements also. Rain or shine, summer or winter, the work continues. Storms and heavy snows require the concentration of all forces at threatened points. Lines of communication must be kept open. Transportation must be kept moving. For this is an open-pit operation, with all that it implies.

Ahead of actual operations, go the prospect drillers, sinking their diamond or shot drills deep into the ground to obtain information. Maps are made and a plan of campaign drawn up. Power shovels clean the dirt, or overburden, from the rock surface. The rock drillers sink their holes into the rock and the holes are then loaded with explosives and blasted. Then come the big power shovels, tracks are run in, and the cars loaded, shunted around by small locomotives, and later picked up in trains by hauling locomotives and taken out.

The operations require an enormous amount of auxiliary service. Operations are forever on the move. Compressed-air lines for drilling must be taken up and relocated. The same thing applies to pumps, power lines, railway tracks, telephone lines and many other items. All equipment



Cable-way stations on the King property of the Asbestos Corp. at Thetford Mines.



A primary gyratory crusher with a capacity of 500 tons per hr. at the Johnson plant at Thetford.

is subjected to heavy duty with the necessity of constant inspection and repair.

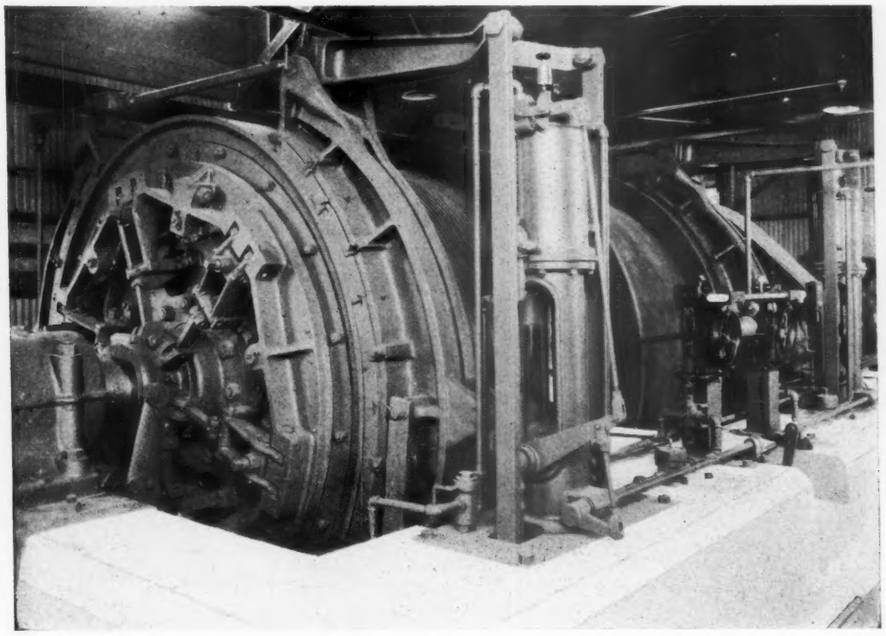
With the electrification of the mining operations, the pit has taken on a vastly different appearance. Power transmission lines now run everywhere. Poles of varying heights and weights, together with the portable steel towers, are in evidence all over this pit.

At Asbestos the Canadian Johns-Manville Co. mines employ a method somewhat different from that used in other properties, using what is known as open-cast work. After blasting the rock, the material is picked up by huge steam shovels and loaded into large gondola cars, which are drawn direct from the quarry up to the mill, where the rocks are dumped into a large bin from which they pass into the crushers. These are direct motor-driven and will take a rock approximately 5 ft. by 2 ft. by 2 ft., weighing several tons. After going through the primary crusher, the material is again passed through a crusher. From there it is carried by elevator or buckets to the driers, from the driers through the mills, where the fibers are separated from the rock by air suction, and they are then graded and bagged and otherwise prepared for the market.

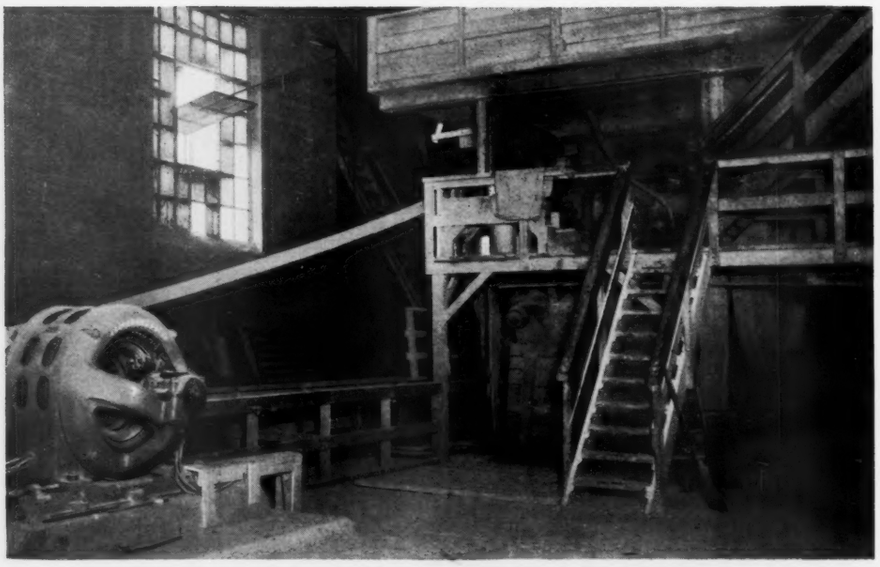
Going from Asbestos towards Thetford Mines, on the way is a property operated by the Nicolet Asbestos Co. This is worthy of mention because it lies between Asbestos and Thetford and thereby proves the continuity of the belt, or band, of asbestos from one district to the other.

From Nicolet we proceed to Black Lake, where some of the properties of the Asbestos Corp. and the Johnson Co. are found.

Proceeding from Black Lake to Thetford, we pass the Maple Leaf property of the



An electric hoist, operating at a speed of 750 ft. per min. at the Johnson plant.

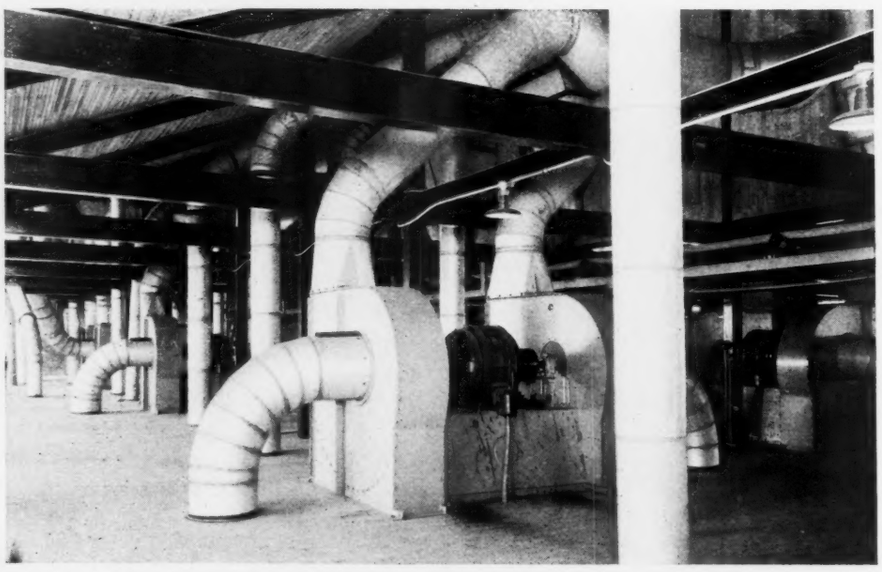


Crusher and drive at plant of the Canadian Johns-Manville Co.

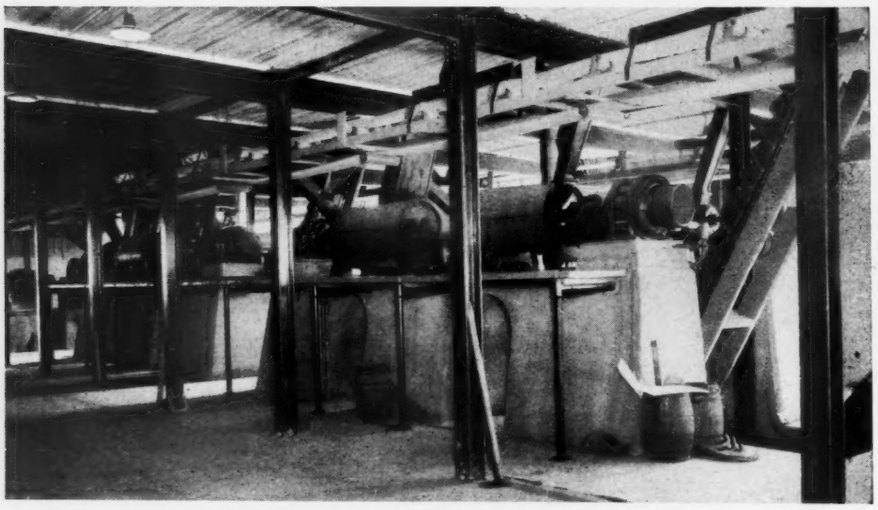
bestos veins in place. These veins, or seams, are found between the mother rock, and the better and wider seams are carefully put aside awaiting the "cobbing" process. The pits have endless stringers or smaller veins, and these are used in the milling process, being too small to break away from the mother rock or matrix. The rock and everything it contains is passed through the mill, where the separation takes place.

Mines neighbouring Bell's are those of the Johnson Co. and the Asbestos Corp. A tremendous wall of rock separates the Johnson pit from Asbestos Corp., and come to what is going to be the most modern asbestos mill in the world. This mill is now being erected by the Johnson Co. which is probably the pioneer in the asbestos field, the properties having been operated for many years by the late Andrew Johnson, who may be called the "Father of Asbestos." The method of milling asbestos is best illustrated by this mill, and a number of the photographs deal with the process.

From the Johnson property we proceed to Bell's. Bell's is known as the most productive asbestos mine in the world. A view in the Bell pit shows the actual as-



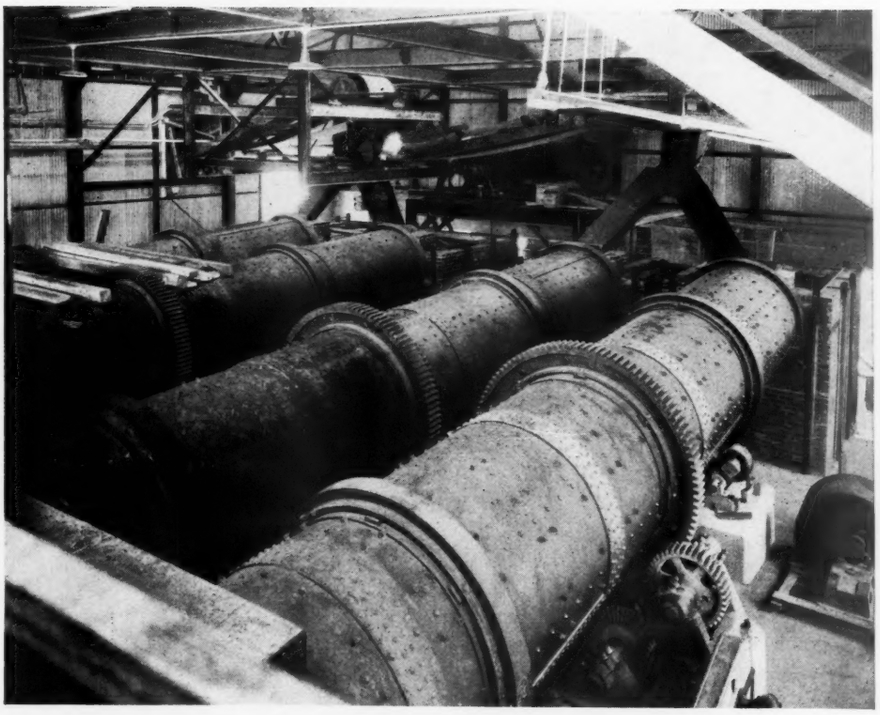
Air separators which grade the asbestos fibers.



Jumbo mills used for fine reduction at the Johnson plant.

the Bell pit, and this at a later date, when the new Johnson mill and quarrying methods have been finished, will be removed. In former years a high wall, known as the "Bonne Femme," existed between the Bell and King pit. This wall was dynamited and thousands of tons of rock containing the asbestos were blown into these pits, which in the interval have been disposed of. The King pit is the deepest quarry of them all, being 450 ft. at the lowest spot.

The Asbestos Corp. operates King's pit by the great-



Rotary driers at the Johnson plant where the crushed rock is thoroughly dried.

est cable-way system in existence. Some idea of the magnitude of the operations carried on may be gained by the fact that more than 7,000 tons of rock is hoisted daily out of this one pit by cable, and that approximately 15,000 tons of rock is handled every day at the various properties of the Asbestos Corp. From derrick to derrick there is a span of over 1,400 ft. at King's pit.

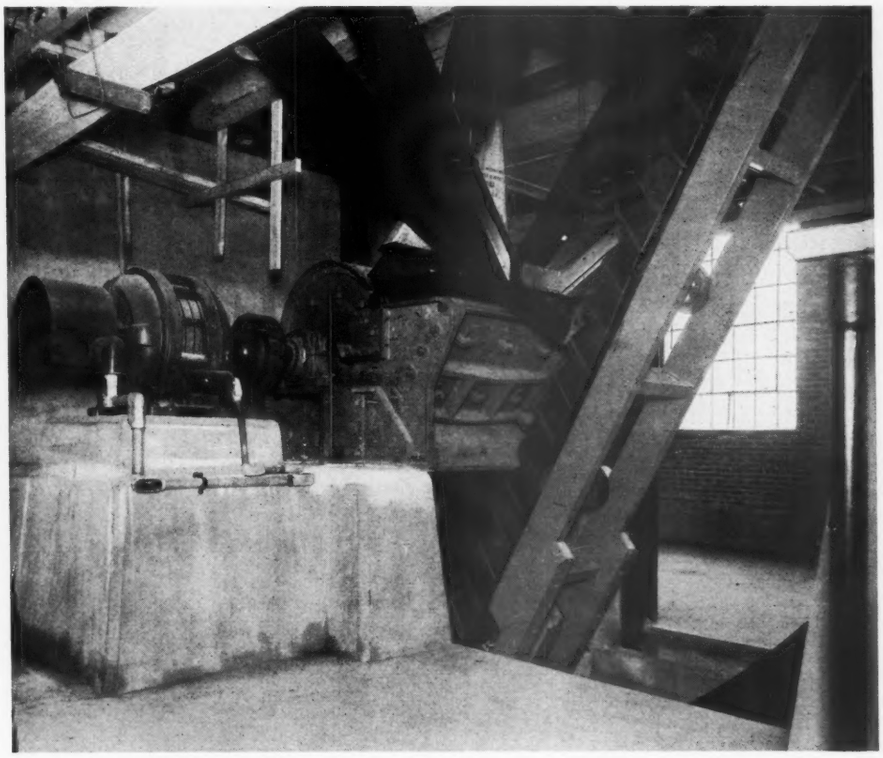
From Thetford we continue to Broughton, passing such places as Robertson and other small towns where formerly asbestos was mined, and visit the property of the Quebec Asbestos Corp. This property is owned by the Philip Carey Co. of Cincinnati, O., manufacturer of asbestos goods, so that its raw-asbestos requirements are supplied by its own mines. The properties at Danville are owned by the Johns-Manville Co., and the Bell property at Thetford is owned by the Keasbey & Mattison Co., so that the three largest asbestos manufacturers in the United States have their own sources of supply. The Asbestos Corp., Johnson Co. and Nicolet Asbestos Co. being independent, supply the other manufacturers.

At the Quebec Asbestos Corp. in East Broughton different methods of mining are carried on. The deepest point of its quarries is 125 ft. and the area of the pit covers approximately 10½ acres of the total property owned, consisting of 500 acres. This corporation uses both steam and electric shovels and locomotives on its property, and hoists about 1,000 tons of rock per day. The rock is of a soft nature.

From the pits the material is elevated through a tunnel 400 ft. long to a crusher which handles about 100 tons of rock per hour. This crusher feeds into a storage bin and from there the material is passed through the regular milling operation into a mill of 1,000 tons capacity. From this one property, approximately 40,000 tons of fiber is produced in a year, although no grades higher than the better class of shingle and paper stock are produced.

At the present time the largest storage bin in the world for asbestos ore is being built at Broughton, and when finished it will have a capacity of 150,000 tons. It is interesting to note that the pits have been worked for about 25 years without any noticeable diminution of the veins.

Some idea of the magnitude of the operations car-

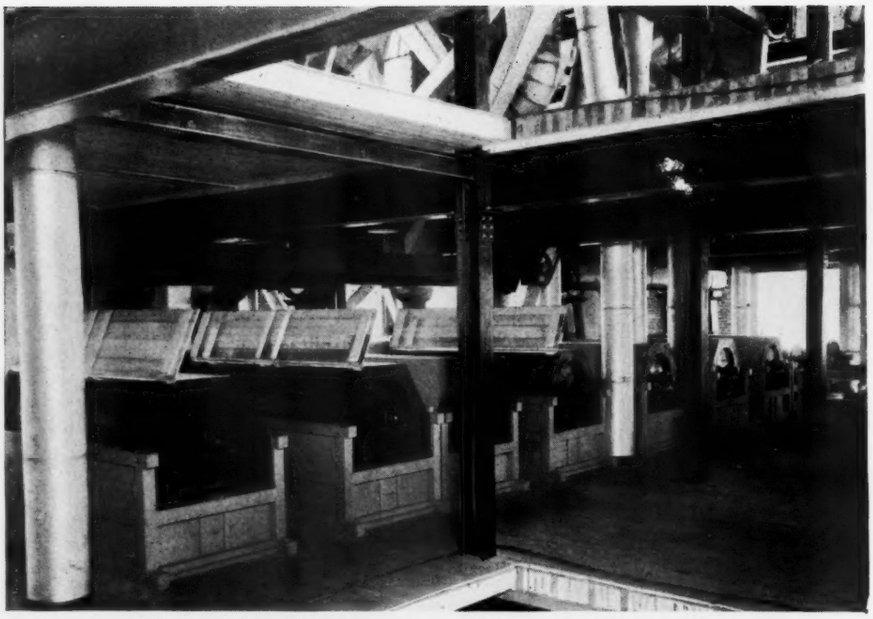


One of the bucket elevators used in handling the crushed rock.

ried on by the Asbestos Corp., Ltd., may be obtained from the following figures showing the tonnage of rock hoisted at its various mines in one day.

| | |
|---|---|
| King's Mine ... | 7,261 tons |
| Beaver Mine ... | 2,848 tons |
| British Canadian | 2,660 tons |
| Maple Leaf Mine | 755 tons |
| Vimy Ridge Mine | 610 tons |
| Asbestos Mines . | 955 tons |
| | 15,089 tons |

The cable-way at the King mine is the largest of its kind in operation. The capacity of the six mills is approximately 11,000 tons of rock per day and about 3,000 tons of barren rock and earth is moved in addition.



A battery of revolving separators used in grading asbestos fibers.

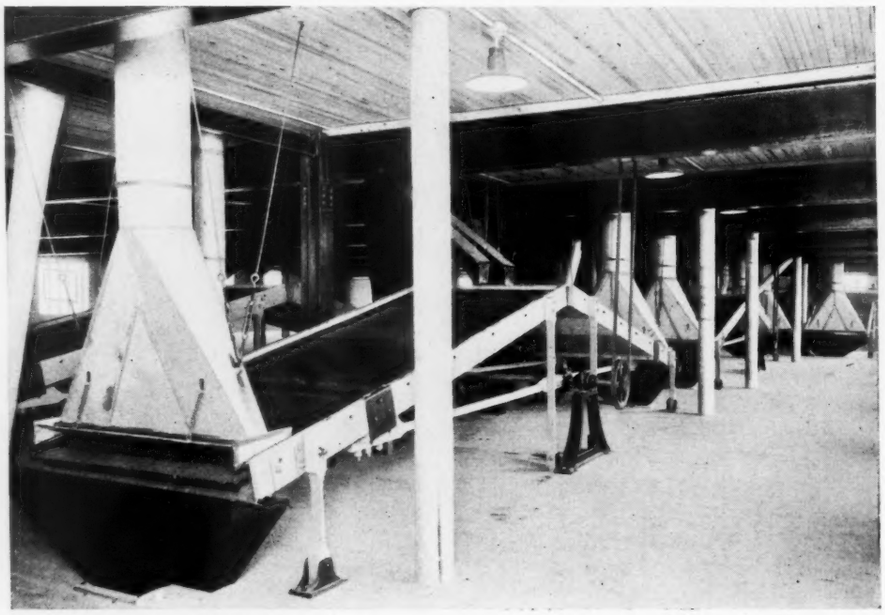
Young women are engaged in "cobbing," or separating the grades of asbestos by means of a small, heavy hammer.

At the Maple Leaf and Asbestos Mines, as well as at the Beaver Mine, rock is loaded by electric shovels into cars rather than by hand into boxes as at the King pit. At Vimy Ridge hand-loaded boxes are hoisted to cars by cranes.

At British Canadian rock is milled down glory-holes 300 ft. deep and loaded through chutes into cars, which are hauled by electric locomotives through two miles of underground tunnel.

The Asbestos Corp., Ltd., controls approximately 30,000 acres and the deepest point in its property is at the King pit, which has reached a depth of 400 ft. The cableway on this pit is 1,400 ft. alone, and the skips on the cableway are 10 tons and 5½ tons, and as much as 14,000 tons of rock has been moved in one day at this particular property. The capacity of the King mill is 200 tons of rock per hour and the driers are three in number—vertical 7 ft. by 7 ft. by 51 ft. high.

The corporation employs about 16,000 hp. per day and operates two electric shovels of 2 cu. yd. each and four steam shovels of 1½ cu. yd. each. The primary crusher



Shaking screens which also act as conveyors, carry the asbestos fiber to the blowers.

weighs 132,000 lb., is 42 in. by 36 in. in size and has a capacity of 225 tons per hour.

In all, the corporation has six mills—capacity of 500 tons per hour—which are active, and seven inactive mills. Altogether it has 12 electric locomotives, 8 steam locomotives, approximately 300 cars, and has produced as much as 120,000 tons of fiber in one year.

To give some idea of the life of an asbestos mine, the King pit has been worked, according to information, approximately fifty years, and during the course of a single year over 300,000 tons of rock goes to the dump from the pit and 1,300,000 tons of rock is taken out in the course of the year. This pit is 750 ft. wide by 1,000 ft. long.

The corporation at its various mines produces various grades of fibers. Those at Thetford and Black Lake differ from those at Vimy Ridge, the last-mentioned of which is more similar to Rhodesian and Russian. At East Broughton the material produced is more of the slip-fiber variety.

There are about 1,500 men employed in normal times at the Asbestos Corp.

The Bell Asbestos Mines, which are recognized as among the richest asbestos mines in the world, cover approximately 175 acres, of which the Bell pit alone reaches a depth of 200 ft. and roughly covers 25 acres and is approximately 1,000 ft. square.

The property is equipped to handle 2,000 tons of rock per day. The rock is hoisted through an incline into cars and the capacity of the crushers is 150 tons per hour. The capacity of the hoist operating through the tunnel is approximately 240 tons per hour and the total length of the tunnel is 1,100 ft.

The Bell property employs two 1¼-cu. yd. steam shovels, steam locomotives and approximately 75 cars. The capacity of the mill is 2,000 tons per day and it has produced as much as 60,000 tons of fiber in a year. The company operates three 15-ton capacity steam locomotive cranes, and the mills cover approximately 65,000 sq. ft. The capacity of the dry-rock storage bins from which this rock goes to the secondary crusher, is 7,500 tons. The firm uses approximately 1,500 k.-w. hp.

What is probably the largest asbestos property in the world is that situated at Asbestos, near the village of Danville, operated by the Canadian Johns-Manville Co. This pit is practically a true circle in outline, having an area of about 80 acres. The rock is not hoisted, but is taken out of the pit by locomotives and cars.

The company owns about 700 acres of land and operates four 4-cu. yd. electric shovels, four 2½-cu. yd. steam shovels and three 1½-cu. yd. steam shovels—a capacity greater than all the other mines in Canada. This pit handles about 15,000 to 25,000 tons per 10-hr. shift, and the deepest point in the pit is 200 ft., the width and length of this pit being 2,100 ft. The company operates a crusher weighing about 220,000 lb., and the capacity is 450 tons per hour. As much as 1,350,000 tons has been moved in one year to the dump.

The pit was opened in 1887. The capacity of the mill is 6,000 tons per 20-hr. day. There is one electric locomotive, one motorized car, 20 steam locomotives and over 100 cars. The company uses 8,000 hp., steam and electric, and approximately 3,500 car-loads of product is shipped per year.

The Canadian Johns-Manville Co. is owned by the Johns-Manville Corp. of New York, which operates 13 factories throughout the United States and Europe. It has two asbestos mines and employs approximately 10,000 people, and manufactures over 1,000 individual products. The business was started in 1858.

The Johnson Co. has lately completed a new mill, which has two units; one of which is equipped to handle 125 tons of rock an hour and has 36 collectors, 6 Jumbos, 13 double and 2 single fans, 4 horizontal driers, one primary gyratory Kennedy crusher, 36 in. by 60 in., actual opening 120 in., capacity 500 tons per hour, with a grizzly-type feeder, and two secondary Kennedy crushers 8 in. by 24 in. are also used. The entire mill screens are driven with V-type belts, of which 700 ft. is used and also about 5,000 ft. of conveyor belt. The mill is 204 ft. by 85 ft. 6 in., six stories high, and is built of 12-in. brick and steel.

The total horsepower for one unit is 3,500, with 1,300 hp. for the second unit. The primary crusher alone weighs 132,000 lb., requiring a 150-hp. gearless motor. The gravity cars are "spotted" in the pit by an oil-electric locomotive. The mill has 19 direct-driven ball-bearing graders, as well as 56 screens, 8 Jumbos, each driven by a 50-hp. motor, one Williams crusher direct connected to a 125-hp. synchronous motor, and is, no doubt, the most up-to-date asbestos plant ever built in Canada.

The crusher house is 60 ft. by 120 ft. by 60 ft. The secondary crushers are direct-connected with a 50-hp. synchronous motor. The driers are 40 ft. by 66 in., and are automatic coal-fed gear-driven with forced- and induced-draft fans driven by two 75-hp. motors. The capacity of the hoist is 30 tons pull. With 1⅜-in. cable on the 8-ft. by 4-ft. drum, 1,550 ft. of cable is used, running 750 ft. per min. The hoist is remote-control-driven by a 450-hp. motor, and was built by the Canadian Ingersoll-Rand Co. at a cost of $40,000.

The deepest point of the pit is about 200 ft., with an area of about 400 by 700 ft. The old plant was steam-driven by a 150-hp. Corliss engine and also a high-speed 750-hp. motor. The present power consumption of the property is about 1,500 k.w. The mill capacity of the new mine at Thetford is 120 tons per hour as against 50 tons in the old plant. The plant at Black Lake produces 40 tons per hour.

Formerly the Johnson's Co. hoisted all the rock, but under the new system it has driven a tunnel over 1,000 ft. long by 9 ft. high by 11 ft. wide. It is using two electric cranes of 3½ tons' capacity and is hoisting the rock through this tunnel.

The property of the Nicolet Asbestos Mines, Ltd., is situated between Asbestos, where the properties of the Canadian Johns-Manville Co. are located, and Thetford and Black Lake where the other mines have their properties.

This company is practically a newcomer. It owns

approximately 1,200 acres of surface and mining rights. The plant and equipment are modern in every respect, having only lately been started. The mining is done by a gasoline-driven steam shovel having a capacity of 1¼ cu. yd. The shovel loads direct into cars, which are hauled up an incline and dumped into the top of the storage bin over the crusher, the cars having a capacity of from 10 to 12 tons. The hauling is done by an electric hoist. From the rock bin the material is fed into the primary crusher, which has a capacity of about 100 tons per hour. From the primary crusher the rock passes through a second crusher and then through two twin driers, whence it is carried into a further storage bin with a capacity of 700 tons. It is then fed to the mill, where it is given a third crushing and subsequent treatment by the usual disintegrating machines, screens, etc.

The main building, that is the mill proper, is three stories high and 120 ft. long by 80 ft. in width. The property produces fibers only, and does not enter the market with crudes.

The Quebec Asbestos Corp. mines are situated at East Broughton and are unique for the quality and percentage of the fibers obtained from the ore. The area of the property is 500 acres and the deepest point in the pit is 125 ft. The pit covers 10½ acres, and measures 1,400 ft. by 450 ft.

The company uses Marion and Quebec electric shovels with a capacity of 1¾ cu. yd. each, and one steam shovel. It has one electric locomotive and two steam locomotives. It hoists 1,000 tons of rock per day in 15 skips, which carry 7½ tons. The rock passes through a tunnel 400 ft. long by 8 ft. by 14 ft., and from the tunnel passes on to the crusher, 42 in. by 36 in. which has a capacity of 100 tons per hour. It then passes to the storage bin, 50 ft. by 22½ ft. The capacity of the mill is 1,000 tons and the total horsepower used is 1,500.

This company employs very modern motors up to 300 and 400 hp. each, and has two horizontal driers. The plant machinery is 95 per cent. ball-bearing. It has produced as much as 40,000 tons of fiber in a year. The company has lately completed a bin with a storage capacity of 150,000 tons. The mill employs 150 men.

## New Crushing Facilities on Dredge

(*Continued from page 24*)

plies and to the railroad tracks for bulk cement supplies. The "mixing" equipment consists of a Blaw-Knox overhead hopper, two weighing batchers, a Koehring 2-cu.yd. mixer, a separate cement elevator, and a supply hopper. A 35-ft. by 18-in. belt conveyor delivers the aggregates from the head pulley of the bridge conveyor to the Blaw-Knox hopper. But one grade of gravel and one of sand are supplied to it, usually an 1½-in. size. When a ¾-in. gravel is needed, a platform, extending from the batching floor to the bin structure, provides means whereby this material can be wheeled to the gravel-weighing batcher and dumped therein. The aggregate-batching equipment consists of a 2-compartment Blaw-Knox unit equipped with a double beam scale and tell-tale dial.

Cement is purchased in bulk in carload quantities and is unloaded by hand into concrete buggies. These are wheeled on a platform which extends direct to the boot of cement elevator. The latter, furnished by the Columbus Conveyor Co., delivers the cement to a 2-compartment supply bin storing a total of 75 bbl. of cement. The elevator is 49 ft. high on centers and is equipped with a 12-in. belt fitted with 10-in. by 16-in. buckets. From the cement-supply bin, a 10-in. screw conveyor delivers the desired cement to the cement-weighing batcher.

The mixing of the concrete is handled by a Koehring (rebuilt by the Equipment Corp. of America) 2-cu. yd. mixer which is driven by a 50-hp. motor. Water is supplied and batched through a Koehring volumetric-type control tank.

All deliveries of concrete are made by outside-owned trucks under contract, the company owning but one truck fitted with a bath-tub body. With the present equipment, a maximum of 400 cu.yd. of concrete can be produced during a day's run.

Provision has also been made for the stock-piling of gravel on a large scale. Parallel to the railroad tracks and extending 400 ft. from the bin structure, a long gallery conveyor has been built. Materials can be by-passed direct from the discharge end of the bridge conveyor to the gallery conveyor and sent out to the desired pile, where they are dumped by a Stephens-Adamson conveyor tripper. The gallery itself is 40 ft. high and is built on wooden bents. Approximately 1,000 carloads of material can be stored in the pile. Reclamation of stocked material is made by a McMyler Interstate ¾-cu.yd. crane.

A new barge-unloading dock is now under construction at Moundsville, W. Va., about 13 miles south of Wheeling. It will be equipped with a stiff-leg derrick and a truck-loading bin. A supply of aggregates will also be stocked for reserve capacity. The Moundsville dock will enable the Standard company to render better service to its trade in that city.

## Lime-Chlorine in Sewage Treatment

(*Continued from page 44*)

cally every sewage problem and the addition of lime produces the double benefit of improving the efficiency of chlorine and at the same time reducing the cost of such treatment.

The lime-chlorine process is now being used in Baltimore purely to control algae development and to eliminate nuisance from the tidal waters receiving 69 to 90 million gallons of the treated sewage plant effluent each 24 hours. At the present rate of application, from 290 to 385 tons of chlorine and from 360 to 480 tons of lime will be required annually. Although recently installed, the process is producing results which pass original expectations.

Additional details of this process are given in an article by Linn H. Enslow entitled "Ammonia-Clorine Reactions and Lime-Chlorine Process," which was published in the March, 1931, issue of Water Works & Sewerage. (Vol. 78, No. 3, pp. 55-59.)

# MEN OF THE INDUSTRY

The portrait printed on this page in each number of PIT AND QUARRY is selected without significance as to current events or the position of the individual in the industry.

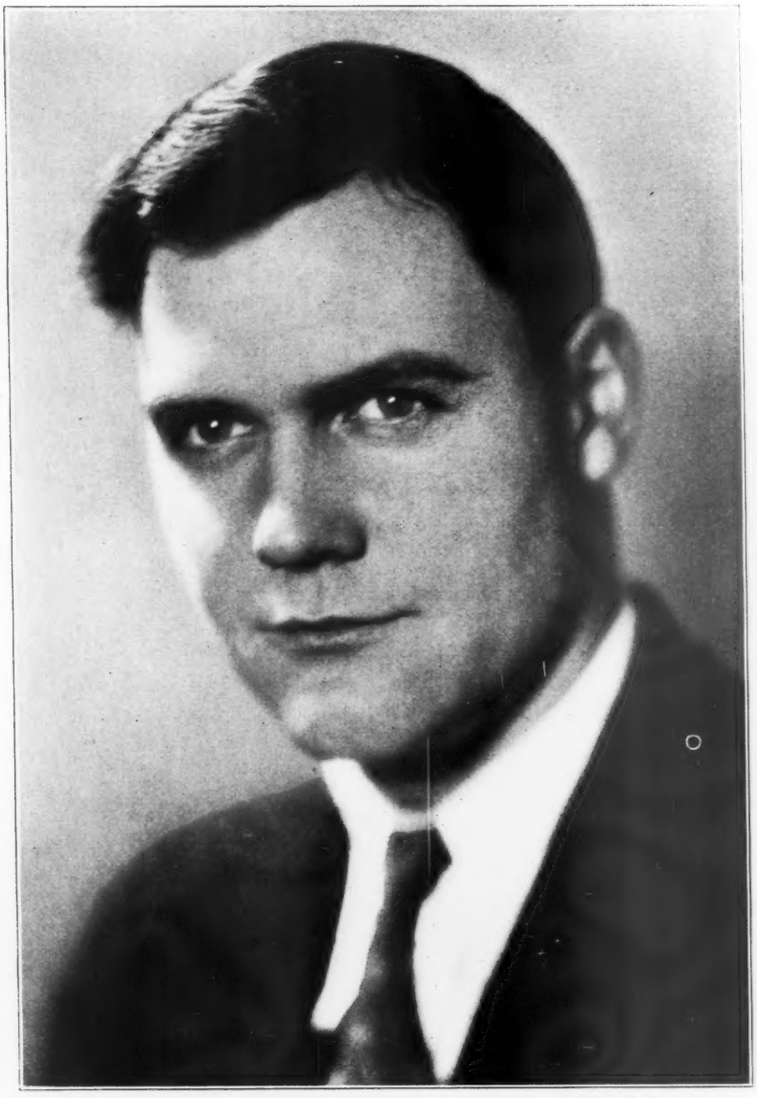


*Photo by Loubell Studios*

**C. D. NORTH**

Superintendent, Chicago Plant

France Stone Co.

# Coming Events

**Aug. 13, 1931. St. Louis, Mo.** Monthly meeting, St. Louis Quarrymen's Assn., Forest Park Hotel. E. J. McMahon, exec. sec., 4063 Forest Park Blvd., St. Louis, Mo.

**Aug. 30-Sept. 4, 1931. Buffalo, N. Y.** Eighty-second meeting, American Chemical Society, Hotel Statler.

**Sept. 4, 5, 1931. Fresno, Cal.** Regular meeting, California Associated Concrete Pipe Manufacturers, Hotel Fresno. A. A. Clark, secretary, Box 368, Visalia, Cal.

**October 12-16, 1931. Chicago, Ill.** National Safety Congress. W. H. Cameron, secretary, National Safety Council, 20 N. Wacker Drive, Chicago, Ill.

**Jan. 9-15, 1931. Detroit, Mich.** Annual Convention and show, American Road Builders Assn. Chas. M. Upham, engineer-director, National Press Bldg., Washington, D. C.

**Jan. 25-26, 1932. Pittsburgh, Pa.** Annual convention, National Ready-Mixed Concrete Assn., Wm. Penn Hotel. V. P. Ahearn, executive secretary, Munsey Bldg., Washington, D. C.

**Jan. 27-29, 1932. Pittsburgh, Pa.** Annual convention, National Sand & Gravel Assn., Wm. Penn Hotel. V. P. Ahearn, secretary, Munsey Bldg., Washington, D. C.

**Feb. 3-4, 1932. Washington, D. C.** Annual meeting, Sand-Lime Brick Assn. Ellen Knight, sec., 321 N. Hamilton St., Saginaw, Mich.

**Feb. 23-26, 1932. Washington, D. C.** Annual convention, American Concrete Institute, Wardman Park Hotel. Harvey Whipple, sec., 2970 West Grand Blvd., Detroit, Mich.

# Pumpings from the Old Pit

*Excerpts from the old files of* PIT AND QUARRY *reveal many interesting sidelights on the activities of the pits, quarries and plants of former days. These are printed in this column each issue.*

### *Fourteen Years Ago*

THE Mackinaw Sand & Gravel Co., operating plants at Mackinaw and Chillicothe, Ill., announced an increase in its capitalization to $100,000 and a change of name to the McGrath Sand & Gravel Co. Two new plants were to be built at Pekin and Forreston, Ill. Directors of the company were J. W. McGrath, T. E. McGrath, T. L. Blackburn, Fred W. Longlan and Dean Hill, all of Lincoln, Ill.

* * *

The Empire Land Co. of Savannah, Ala., opened a pit and plant on an 800-acre deposit located near North Montgomery, Ala.

### *Ten Years Ago*

AN extensive article described the plant and dredging operations of the Arundel Corp. of Baltimore, Md. The company's plant at Curtis Bay, Md., was said to be the largest in the United States.

* * *

The Service Sand & Gravel Co. was incorporated with a capital of $125,000 at Rockford, Ill. The incorporators were Swan Lindskold, Joseph Martus and Frances Lindskold.

* * *

The International Cement Corp. and subsidiary companies reported a net income for 1920 of $1,779,559 as against $317,603 in 1919—an increase of about 350 per cent.

A blast in the quarry of the Charles Stone Co. of Whitehall, Ill., brought down 70,000 tons of stone. This was considered a record shot for crushed-stone quarries at the time.

### *Five Years Ago*

A WARNING against over-production in the cement industry appeared in an article taken from *The Index*, published by the New York Trust Co. Demand for Portland cement in 1926 was approximately 160,000,000 bbl., while the producing capacity was nearly 200,000,000 bbl. annually.

* * *

William E. Carson, president of the Riverton Lime Co. of Riverton, Va., was honored by appointment as head of the conservation commission of the state of Virginia. The appointment was made by Gov. Harry F. Byrd. Mr. Carson had previously served the National Lime Assn. as its president for a period of fifteen years.

* * *

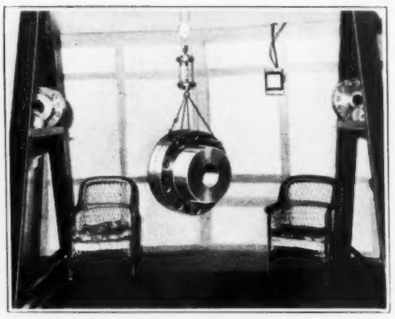
New incorporations included the following: Hackettstown Sand & Gravel Corp., Hackettstown, N. J.—C. M. Witaker, Richard Townsend and Alvin Ohlsen; D. & G. Sand & Gravel Co., Passaic, N. J.—Hawley Dotz and Daniel Glerum; Mogadore Sand & Gravel Co, Canton, O.—C. A. Calhoun, John Coats, Walter McConnell, Wilbur Coats and David Dougherty; Loudon Sand & Gravel Co., Loudon, Tenn.—S. P. Daniel, S. P. Wilson, D. F. Smith. J. H. Kollock and O. V. Harrison.

## Conducts Enlightening Flexible-Coupling Test

An Eastern coupling manufacturer conducted a most unusual and interesting flexible coupling test at the national convention of iron and steei engineers at Cleveland in June.

The flexible element in the coupling, being the vital point subjected to shock or friction and pressure due to misalignment, was selected as the coupling part on which to make the test.

A steel frame was set up and a large 10-in. bore, 2100-lb. coupling was suspended by three rods inserted through



The coupling under test.

the pin holes in the two flanges of a small 1⅜-in. bore coupling. The unit was then connected to a hoist which jolted the weight up and down, and brought direct shock and pressure to bear on the rubber bumpers.

While the shock service imposed was in no sense as extreme as that in actual operation, this demonstration clearly proved that the rubber bushing in this type of flexible coupling is not a vulnerable spot.

The Ajax Flexible Coupling Co. of Westfield, N. Y., has always contended that the rubber bushings in its couplings would not work loose, and used this demonstration to prove the point.

## A. J. Grindle to Direct Pulverized-Fuel Sales

The Beardsley & Piper Co., Chicago, manufacturers of sandslingers and foundry equipment systems, announces the acquisition of the services of Aubrey J. Grindle, prominent pulverized-fuel engineer, who has been placed in full, active charge of the newly-organized pulverized-fuel department.

Mr. Grindle, a pioneer in the pulverized-fuel industry, began experiments in this field in the year 1909. During many years of experimental work and persistent efforts to improve equipment and methods of using pulverized fuel, many successful installations have resulted throughout the United States and Canada, gaining for Mr. Grindle the reputation of being one of the foremost pulverized-fuel engineers.

Mr. Grindle will have complete charge of engineering, manufacture and sale of pulverized-fuel systems sold by The Beardsley & Piper Co.

# Personal Mention

**Edward Sidebotham** of Hermosa Beach., Cal., has started work on a new stone quarry near Corona. Rock-crushing machinery is reported to have been purchased and will be installed shortly.

**D. J. Quammen** has been appointed manager of the Philadelphia district office of Cutler-Hammer, Inc., Milwaukee, Wis., manufacturers of electric motor control and allied apparatus. Mr. Quammen succeeds **F. J. Burd**, who has been made assistant manager of the Chicago office. Mr. Burd will have charge of industrial sales in the Chicago district, and of the C-H (Harland) paper machine drive throughout the country.

Mr. Quammen has been connected with the Philadelphia office of Cutler-Hammer for the past five years, as a sales engineer. He is a graduate of the University of Wisconsin, Class of '24, with a degree of B. S. in Mechanical Engineering. His proven ability as a motor-control engineer and his long familiarity with the many products sold by Cutler-Hammer make him particularly suited for his new position.

**Samuel P. Harris** has disposed of his building-materials business at Portland, Ore., and will devote his entire time in the future to the sales of plaster and gypsum products manufactured by the Standard Gypsum Co. Mr. Harris has represented the company in that area for several years.

**Ralph M. Hoffman**, for eight years manager of the Seattle office of the Pacific division of Link-Belt Co., has been appointed vice-president and sales manager of that division, with headquarters at San Francisco. He succeeds Harold H. Clark, who retired June 1.

**E. I. West** and associates will soon install about $30,000 worth of machinery to tap one of the Feather River gravel beds in the vicinity of Oroville, Cal. It is believed that these beds are rich in gold and riffles will be installed at the plant to extract it from the gravel. It is not definitely decided, according to reports, whether the operation will be conducted by dredge or drag-line. Work will probably start in about 90 days.

**J. S. Tritle** was elected vice-president and general manager in charge of manufacturing, sales and engineering operations of the Westinghouse Electric & Manufacturing Co. at a recent meeting of the board of directors.

Mr. Tritle became manager of the Kansas City district for the Westinghouse company shortly after the close of the World's Fair at St. Louis. In 1915 the St. Louis and Kansas City offices were consolidated, Mr. Tritle assuming charge of both. In 1922 he was made manager of the merchandising division of the general sales department of the company. In 1925, when a separate department was made of the merchandising business, Mr. Tritle was made general manager of the merchandising department overseeing engineering and manufacturing, as well as sales work, with headquarters in Mansfield, O., where most of the merchandising products are made. From Mansfield he was moved to East Pittsburgh on May 1, 1929, as vice-president in charge of manufacturing operations. In his new position as vice-president and general manager, Mr. Tritle will retain his headquarters at the main works in East Pittsburgh, Pa.

**R. E. Ratcliffe**, who has been representing the American Wire Fabrics Corp. and the Wickwire Spencer Sales Corp. in the Texas district, has been transferred to the district office at Tulsa, Okla., to take the place of **Lawrence J. Baldwin**, who has resigned. **Robert Dougan**, formerly connected with the Gulf Concrete Pipe Co. of Houston, Tex., has been made manager of the structural-products department in the Tulsa district for Wickwire Spencer, to take the place of **J. M. Mercer**, who has resigned to go in business in California as a member of the Curtis Whitney Steel Co.

**G. L. Harris** has been appointed manager of office systems of the Westinghouse Electric & Manufacturing Co., it is announced by President F. A. Merrick. Mr. Harris has had extensive experience in office management and procedure, having been manager of office systems for the Philadelphia Electric Co. for the last three years. Previously he was manager of office systems for the Georgia Railway & Power Co. at Atlanta, and for several years organized and installed office systems in the Insull properties at Chicago.

**H. M. Lawrence**, lately appointed to the staff of the American Standards Association, is in charge of all the mining, chemical, and ferrous and nonferrous metallurgy projects being developed under the procedure of the A. S. A. He comes to the Association from the International Agricultural Corp., where he was employed as mining engineer. From 1924 to 1930 he was connected with the United States Bureau of Mines as metallurgist.

**Pichegru Woolfolk**, who has been associated with the Bartlett-Hayward Co., Baltimore, since 1914, has been appointed assistant general manager of the company.

**Stanley F. Plachecki** and **Thomas E. McHugh**, of Tyrone, Pa., recently purchased the plant of the Enterprise Lime & Ballast Co. at Hyndman, Pa.

**E. A. Thumlert** has recently joined the sales organization of The Fairfield Engineering Co., Marion, O. He will specialize in the design and sales of skip hoists for handling coal and ashes, as well as ash hoppers and gates. For the past twenty years Mr. Thumlert has specialized in engineering and sales work in connection with the design and installation of skip hoists. Mr. Thumlert was connected with the Beaumont Co. for some sixteen years, and for several years was secretary and general-manager of the Beaumont Co. He was later connected with the Palmer-Bee Co. of Detroit.

**George F. Newell** has been elected vice-president and general manager of the Pyrometer Service and Supply Corp., located at 1988 E. 66th St., Cleveland, Ohio, which is a subsidiary of the Claude S. Gordon Co. of Chicago, pyrometer and industrial X-ray engineers. He was formerly the St. Louis representative of the Charles Engelhard Co., and more recently the Chicago representative of the same firm.

**Charles E. Shearer** has been named assistant sales manager of the Keystone Portland Cement Co. of Philadelphia, Pa. Mr. Shearer was with the Atlas Portland Cement Co. before its affiliation with Universal and since then had been doing sales work for the Pennsylvania-Dixie Cement Corp.

## Obituary

**Louis H. Gipp**, president of the Gipp Construction Co., Buffalo, N. Y., was crushed to death by a gravel truck on June 17. Mr. Gipp had been in the construction business for more than 40 years. He built the Niagara Falls Boulevard, between Buffalo and Niagaga Falls.

**Benjamin V. White**, secretary-treasurer of the Leesburg Lime Co. of Leesburg, Va., died recently.

**Robert D. Gordon**, president of the Gordon Crushed Stone Co. of Toronto, Can., died at his home in Toronto recently.

**Horace A. Middaugh**, 84, founder of the Pioneer Sand & Gravel Co. of Seattle, Wash., died recently. Mr. Middaugh is best remembered for his work in promoting concrete pavement in the northwest. He initiated Seattle's program many years ago by constructing and donating two blocks of concrete-paved streets to the city.

# Traffic News and Comment

## Recent I. C. C. Decisions

*Sand and Gravel.*—The Commission has found unreasonable the rates on sand and gravel from Georgetown, D. C., to points in Maryland, Pennsylvania, Virginia and West Virginia in the following territory: that part of Maryland lying north and west of Washington and Baltimore, Md., the south central part of Pennsylvania lying south of a line from Hanover, Pa., through Gettysburg, Carlisle Junction, Shippensburg, Dunnings Creek Junction and Rockwood, Pa., to Connellsville, Pa., the north central parts of Virginia and West Virginia east and north of a line running south from Connellsville, Pa., through Morgantown to Elkins, W. Va., thence north through Pierce, W. Va., to Cumberland, Md., thence south to Petersburg, W. Va., thence east to Strausburg, Va., and Washington. Reasonable rates will be made by use of a mileage scale. Distances are to be computed over the shortest routes by existing connections for the interchange of carload traffic but not using the lines of more than three line-haul carries. Rates for single line movement at various intervals on the scale are shown below. For joint hauls the rate will be increased 20 cents a ton, and a further arbitrary of 20 cents a ton is to be added for movement over the Chesapeake Beach Railway which is to accrue to that carrier.

The Commission further found that the rates assailed on gravel from Georgetown to points on the B. & O. east of and including Cumberland are and for the future will be unduly prejudicial to Georgetown, and unduly preferential of Martinsburg, Security and Stephens City, Md., to the extent that their relationship to the interstate rates on crushed stone from the three preferred points named, to the same destinations are less favorable to the complainant than would result from the uniform application of the scale of rates prescribed for application from Georgetown. I. C. C. Docket No. 23,157, Smoot Sand and Gravel Corp. v. B. & O. et al.

| Miles | Rate | Miles | Rate |
|---|---|---|---|
| 15 | $0.60 | 200 | $1.50 |
| 60 | .90 | 320 | 1.90 |
| 100 | 1.10 | 350 | 2.00 |

## Suspension Orders

*Building Materials.*—The Commission has suspended various tariffs naming rates in Southern territory, on building materials including lime, cement, plaster, lumber and similar articles effective June 9th, and later dates until January 9th, 1931. I. & S. Docket No. 3614.

*Plaster and Plasterboard.*—The Commission has suspended various tariffs and supplements naming rates on plaster and plasterboard between points in Southern territory, effective June 9th, and later dates, until January 9th, 1932. The suspended schedules change or otherwise rates, charges and regulations or practices applicable on plaster blocks, plaster tile, gypsum rock, and raw gypsum and related articles. I. & S. Docket No. 3615.

## New Complaints Filed

*All Rates.*—The carriers have asked for a flat increase of fifteen per cent in all rates in I. C. C. Docket No. 24,520. While hearings in this case will be held soon it is not expected that any decision will be handed down in time to become effective before the first of next year. While some shippers of heavy loading commodities feel that an increase in rates might be justified they believe that a flat increase per ton would be better in that it would not disturb the competitive relationship that now exists. Each month sees a widening in the range of motor truck deliveries in the non-metallic mineral industry and an increase in railroad rates of any nature will widen this range. Some experienced railroad men are expressing a doubt as to the wisdom of this move in view of transportation competition.

*Agricultural Lime.*—The rates on agricultural burned lime from Berkeley (Martinsburg), W. Va., to points in Virginia are alleged to be in violation of sections 1, 2, 3 and 13 of the act, with intrastate commerce in Virginia preferred, and reparation has been sought in I. C. C. Docket No. 24,456, Bone Dry Fertilizer Co., Inc., Richmond, Va., v. A. C. L. et al.

*Crushed Stone.*—Complainant alleges unreasonable charges and asks reparation on shipments of crushed stone from Dell Rapids, S. D., to Burlington, Ia., in I. C. C. Docket No. 24,506, L. G. Everest Inc., Sioux City, Ia., v. C. M. St. P. & P. et al.

*Crushed Stone, Sand and Gravel.*—The commission is conducting an investigation to determine the lawfulness of the rates on crushed stone, sand and gravel, within the state of Illinois in I. C. C. Docket No. 24,415.

## Examiners' Report

*Cement.*—Examiner Roy E. McKee proposes that the commission find claim alleging unreasonableness of the rate on cement from Cement City, Mich., to Chagrin Falls, O., to have been barred by the statute and dismissed. I. C. C. Docket No. 124,286, Consolidated Cement Corp., v. Cin. Nor.

## Rate-Committee Dockets

### Trunk Line Assn.

*Cement.*—Carries propose to increase the rate 2 cents per 100 lb., over the scale rates shown in I. C. C. Docket No. 15,806, on cement from all points of production and seaports in the states of Alabama, Florida, Georgia, Kentucky, Louisiana east of the Mississippi River, Mississippi, North Carolina, South Carolina, Tennessee and Virginia to destinations on the Valley Railroad Company. Docket No. 27,421.

*Crushed Stone, Sand and Gravel.*—Carriers propose to increase the rates on crushed stone, common sand and gravel, from $1.00 to $1.10 a net ton, from Sherburne, N. Y., to all points on the Unadilla Valley Railroad. Docket No. M-1,813.

*Slag.*—Shippers of slag at Scottdale, Pa., are proposing a mileage scale basis of rates on that commodity, c.-l. min. wt.,[1] using separate scales for the two territories defined: (a) Destinations in Pennsylvania located west of a line drawn from Crooks Mills, Pa., on the B. & O. to Cresson, Pa., on the P. R. R., thence due north to the Pa.-N. Y. State Line, in the state of Ohio on and east of a line drawn from Toledo through North Baltimore, Kenton, Delaware, Alton, Lancaster, Shawnee and Gloucester to Belpre, O. (b) Destinations in the state of Maryland west of Hancock, Md., and state of West Virginia west of Hancock, W. Va. For joint hauls add 20 cents to the scales except to destinations on the Monongahela and B. R. & P.

| Miles | Scale (a) | Scale (b) | Miles | Scale (a) | Scale (b) |
|---|---|---|---|---|---|
| 15 | .... | $0.60 | 150 | $1.20 | $1.30 |
| 20 | $0.60 | .... | 175 | 1.30 | 1.40 |
| 25 | .... | .70 | 200 | 1.40 | 1.50 |
| 40 | .70 | .80 | 230 | .... | 1.60 |
| 60 | .80 | .90 | 290 | .... | 1.80 |
| 80 | .90 | 1.00 | 320 | .... | 1.90 |
| 100 | 1.00 | 1.10 | 350 | .... | 2.00 |
| 125 | 1.10 | 1.20 | | | |

### Central Freight Assn.

*Agricultural Lime.*—Shippers at Carey, O., propose the establishment of a proportional rate of 11 cents per 100 lb., to apply on agricultural lime, c.-l. min. wt. 30,000 lb., from Carey to Cincinnatti, O., applicable on traffic for beyond. Docket No. 28,839.

*Agricultural Limestone.*—Carriers propose to amend agency and individual lines' tariffs publishing rates on agricultural limestone from Gibsonburg, Woodville, O., and Sibley, Mich., to destinations in Michigan by providing for min. c.-l. wt. of 60,000 lb., in lieu of present minimum of 80,000 lb. Docket No. 28,869.

*Burned Dolomite.*—Shippers at Narlo, O., propose a reduction in the rate on burnt or roasted dolomite, c.-l.

min. wt.[1] to Peoria, Ill., from $2.90 a net ton to $2.34. Docket No. 28,841.

*Crushed Stone.*—Shippers at Sandusky have asked that the rate on crushed stone, screenings and agricultural limestone, in bulk in open top cars, c.-l. min. wt.,[1] to Cleveland, O., be reduced from 80 cents to 70 cents a net ton. Docket No. 28,824.

A reduction in the rate on crushed stone and agricultural limestone in bulk in open top cars, c.-l. min. wt.,[1] from West Columbia, O., to Swiss, W. Va., from $2.15 to $1.65 a net ton has been proposed by shippers. Docket No. 28,850.

*Feldspar.*—Reduced rates on feldspar and quartzite, in packages or in bulk, c.-l. min. wt. 60,000 lb., from Wanup and Indian, Ont., are proposed by carries as shown below. Docket No. 28,878.

| To | Proposed | Present |
|---|---|---|
| E. Liverpool, O. ..... | $0.40 | $0.555 |
| Wheeling, W. Va..... | .40 | .555 |
| Buffalo, N. Y. ..... | .275 | .385 |
| Toledo, O. ..... | .32 | .50 |

**Sand and Gravel.**—The carriers propose to reduce the rates on sand and gravel from Mahoning, Cleveland, Phalanx, Mantua and Niles, O., to Bessemer, Braddock, Rankin, Homestead, Lucas, Pittsburgh, McKees Rocks, Groveton, Coraopolis and Stoops Ferry, Pa., from various rates ranging from $1.25 to $1.60 a net ton, to $1.20 a net ton from each of the above points of origin to each of the above destinations. Docket No. 28,809.

*Tripoli.*—Carriers propose to reduce the rate on tripoli, c.-l. min. wt. 40,000 lb., from Tatamagouche, N. S., to Akron, O., from $1.21 to 52½ cents. Docket No. 28,863.

### Illinois Freight Assn.

*Lime.*—It is proposed to reduce the rate on lime, c.-l. min. wt. 30,000 lb., from E. St. Louis, Ill., to Carlyle, Ill., from 12 cents to 10 cents per 100 lb. Docket No. 6,229.

### Western Trunk Line Committee

*Cement.*—It is proposed to add Manitowoc, Wis., as an origin point in Item 35-A of W. T. L. Tariff 132-G naming rates on cement, in mixed carloads with lime, plaster, etc. Docket No. 4,061-C.

*Limestone.*—Shippers at Inland Junction and Blaney Junction, Mich., have proposed a reduction in the rate on limestone, c.-l. min. wt.,[1] to Bettendorf, Ia., from 26 cents to 14 cents per 100 lb. Docket No. 1,601-D.

### Southern Freight Assn.

*Ground Limestone.*—Carriers propose to establish a rate on ground or pulverized limestone, c.-l. min. wt. 60,000 lb., from Valmeyer, Ill., to Memphis, Tenn., of $2.10 and to New Orleans, La., of $3.90 a net ton. Docket No. 55,408.

*Lime.*—Carries propose specifically to restrict the rates on lime from Ohio and Mississippi River crossings to Jacksonville, Fla., when destined beyond, as published on page 12 of Supplement 32 to Speiden's I. C. C. 1,250, by making Item 63 of the tariff nonapplicable. Docket No. 55,423.

Shippers are asking that a rate on fluxing lime, c.-l. min. wt. 80 per cent of the marked capacity of the car but not less than 60,000 lb., of $1.00 per ton from Pelham, Ala., to Alabama City, Ala., be established. The present rate is $1.78 a net ton. Docket No. 55,435.

*Sand.*—It is proposed to establish rate of $2.32 a net ton on moulding sand, c.-l. min. wt.,[1] from Lipe, Tenn., to O'Fallon, Ill., in lieu of the present rate of 29 cents per 100 lb., and in addition to extend the present rate of $2.32 per ton from Lipe to St. Louis, Mo., E. St. Louis and Belleville, Ill., to apply via Nashville and L. & N. R. R. Docket No. 55,495.

### Southwestern Freight Bureau

*Ground Limestone.*—Shippers at Valmeyer, Ill., are proposing rates to Missouri points on agricultural ground or pulverized limestone based on the 9,702 scale subject to the St. Louis-Springfield rate of $1.70 as maximum, and 95 cents per ton as minimum.

Representative rates are shown below. Complete exhibit will be furnished on request. Docket No. 23,146.

| To | Miles | Rate |
|---|---|---|
| Webster Groves..... | 36.8 | $0.95 |
| Bowes ..... | 60.0 | 1.00 |
| St. Clair..... | 78.9 | 1.10 |
| Sulivan ..... | 90.8 | 1.30 |
| Arlington ..... | 149.8 | 1.40 |
| Purdon ..... | 168.7 | 1.60 |
| Springfield ..... | 265.1 | 1.70 |

[1] The proposed carload minimum weight will be 90 per cent of the marked capacity of the car except, when car is loaded to full cubical or visible capacity, actual weight will apply.

# Bureau of Mines Completes Survey of Street-Paving Materials

THE expansion of city-street paving which characterized the ten years ended December 31, 1929, reached its climax in 1927, with decreases reported for 1928 and 1929, according to a survey of 201 representative cities made by A. H. Redfield of the U. S. Bureau of Mines, Department of Commerce. The upward trend, followed by a decline, was general in cities of all sizes included in this study, but was most pronounced in cities of 40,000 to 100,000 inhabitants and in the Northeastern, Southeastern, and Southwestern states. In the North-Central states the trend of paving was downward from 1925 to 1929; in the Pacific and Rocky Mountain states it was generally upward.

Over the United States as a whole, bituminous types of paving continued to lead, furnishing two-thirds of the total street pavement laid in the 201 cities from 1925 to 1929. The actual yardage of bituminous pavement laid in these cities, however, was 3.8 per cent. less in 1929 than in 1925, and the ratio of bituminous pavement to the total pavement dropped from 70.4 per cent. in 1925 to 62.1 per cent. in 1928, rising to 65.1 per cent. in 1929. The area paved with Portland-cement concrete amounted to one-fourth of the total pavement laid in these cities from 1925 to 1929, but the yardage of Portland-cement pavement increased by half during the period, and its share in the total pavement grew from 19.3 per cent. in 1925 to 30.0 per cent. in 1928, declining to 28.5 per cent. in 1929. Brick, block, and stone pavements, which constituted the remaining one-twelfth of the total pavement laid in the 201 cities, decreased one-third in yardage, and declined in relative importance from 10.3 per cent. in 1925 to 6.6 per cent in 1929.

Inquiries were addressed by the Bureau of Mines to the city engineers, superintendents of highways, or corresponding officials of 230 municipalities with populations exceeding 40,000, regarding the area of each type of pavement laid in their respective cities for the five years ended December 31, 1929. Sufficient data for the purposes of the inquiry were received from 201 cities, distributed over 46 States and the District of Columbia and containing an aggregate population of 42,376,000 in 1930. The cities included in the survey accordingly comprise 945 per cent. of the population of the United States living in communities of over 40,000 inhabitants. The purpose of the survey was to obtain over a series of years comparable figures from a sufficient number of representative American cities to permit the study of trends or tendencies in city street paving.

Local preferences, based on such various factors as availability and cost of the different paving materials, cost of initial laying, local traffic conditions, or even custom and tradition, largely govern the choice of the type of street pavement. Seventy per cent. of all bituminous pavements laid from 1925 to 1929, inclusive, in the 201 cities comprised in this survey were laid east of the Mississippi River; sixty-two per cent. of the national total was in cities lying north of the Potomac and Ohio rivers and east of the Mississippi River and Lake Michigan. On the other hand, 61 per cent. of the Portland-cement concrete pavement laid, was put down west of the Mississippi River and Lake Michigan. Similarly, nearly 90 per cent. of all brick, block, and stone street pavements comprised in the survey was put down east of the Mississippi River and Lake Michigan.

Differences in paving practice between the larger and the smaller cities were most marked in the case of bituminous pavements, sheet asphalt being favored by the larger cities; asphaltic concrete in the medium-sized and smaller cities; and asphaltic macadam

(Continued on page 71)

# Financial News

*The information contained in these financial pages is given with the understanding that any statement on the part of this magazine or any of its staff, as to the responsibility or standing of any person, firm or corporation, or as to the value of any property or securities is a mere expression of opinion, given as a matter of service to the readers of* PIT AND QUARRY, *for which no responsibility in any way is to attach to this magazine or to any of its staff.*

## Abrasives Manufacturer Splits Stock 10 for 1

The Norton Co., abrasives manufacturer, Worcester, Mass., has notified the Massachusetts Commissioner of Corporations and Taxation of change in capital stock to 1,800,000 shares of $10 par value from 180 shares of $100 par value. Holders of record June 18 will receive 10 new shares for each old share held. The company has authorized the issuance of 500,000 additional $10 par shares, of which 53,697 shares are to be issued for cash, and 446,303 shares in exchange for all of the shares of the Behr-Manning Corp.

## Schumacher Wall Board Nets 27 Cents a Share

Schumacher Wall Board Corp. for the year ended April 30, 1931, reports net profit of $78,362 after depreciation, federal taxes and deduction of non-recurring charges, equal after $60,344 dividend requirements on the 30,172 preferred shares outstanding at the close of the period, to 27 cents a share on 66,000 outstanding shares of common stock. For year ended April 30, 1930, the company reported net profit of $163,206, equal after $66,000 preferred dividends, to $1.47 a share on 66,000 common shares.

The report of A. R. Moylan, vice-president and general manager, points out that sales volume of the company last year declined only 4 per cent. below that of 1930 and 9 per cent. below 1929, in the face of 46 per cent. decline in building permits in the company's territory.

Schumacher's subsidiary, Gypsum Products Corp. of Seattle, however, suffered losses so considerable that Schumacher was compelled to increase its investment and take over active management. As of October, 1930, the holdings were increased to 66⅔ per cent. from 50 per cent. in common stock of Gypsum products, and the company now is on a profitable basis, Mr. Moylan says.

During the year Schumacher's directors purchased and retired 2,828 shares of preferred stock. Dividend payments on common stock, at the rate of 25 cents quarterly, were inaugurated in March and, according to Mr. Moylan's letter, the expectation of the management is that earnings will justify a continuance of those payments.

Balance sheet as of April 30 compares as follows:

| | 1931 | 1930 |
|---|---|---|
| **Assets** | | |
| Current assets | $ 255,774 | $ 304,439 |
| Investments | 271,437 | 200,073 |
| Fixed assets, net | 1,310,408 | 1,389,277 |
| Deferred charges | 134,126 | 144,239 |
| Total assets | $1,971,745 | $2,038,028 |
| **Liabilities** | | |
| Current | $ 165,133 | $ 99,760 |
| Capital stock | 1,644,041 | 1,727,596 |
| Surplus | 162,571 | 210,672 |
| Total liabilities | $1,971,745 | $2,038,028 |

## Johns-Manville Showing Gain in Second Quarter

Business and profits of Johns-Manville Corp., which in the first quarter of 1931 reached their lowest ebb, have shown a healthy and encouraging improvement during the current three months. Based on results to date, company should be able to show its dividend of 75 cents a share covered for the period; any deficiency will be negligible.

The earnings for April were almost 100 per cent. ahead of the balance of 13 cents a share shown for the 750,000 shares of common in the January-March period. In May there was a further gain, so that June, which is seasonally a good month in the building trades, will have to show a decided slump if the balance for the second quarter is to fall below 75 cents. April and May combined reported net in excess of 50 cents.

The improvement in earning power, of course, amply explains the decision of directors in maintaining the $3 dividend late in May. At the same time it is to be borne in mind that Johns-Manville has a liberal depreciation charge amounting to $2,000,000 per annum, as contrasted with a common dividend requirement of $3,000,000, according to the *Wall Street Journal*. Thus, if it earned nothing for the common it would, in adhering to the $3 rate, draw upon working capital only to the extent of $1,000,000.

## Minneapolis Trap-Rock Firm Plans Improvement

Trap Rock Co. of Minneapolis, Minn., is planning to build a new addition to its plant at Dresser Junction, Wis. Bids are reported to be sought on seven 44-ft. by 57-ft. concrete silo bins; a concrete loading shed under the silo bins; a 76-ft. by 72-ft. screening building above the bins, concrete skeleton, steel roof trusses, and a dust-collecting system.

## Distributor Appointed by Chain Manufacturer

In a move designed to improve the service to users of its product on the Pacific coast, The Union Chain & Mfg. Co., Sandusky, O., has recently announced the appointment of the Industrial Gear & Machine Works, Oakland, Cal., as exclusive distributors for its line of industrial chain products in that territory.

The principals of the western company are W. I. Brown and P. E. Haultain, who will handle all sales. Mr. Haultain, in his former connections, has been closely associated with the chain users of the coast in the industrial fields. Both principals are practical chain men.

**CURRENT DIVIDENDS**

| Company | Class of Stock | Dividend Rate | Holders of Record | Payable | Company | Class of Stock | Dividend Rate | Holders of Record | Payable |
|---|---|---|---|---|---|---|---|---|---|
| Arundel Corp. | Common | $0.75 qr. | June 22 | July 1 | Kelley Island Lime & Trans. | Common | $0.50 qr. | June 20 | July 1 |
| Alpha Portland Cement | Preferred | $1.75 qr. | May 20 | June 15 | Lawrence Portland Cement | Common | $1.00 qr. | June 15 | June 30 |
| Alpha Portland Cement | Common | $0.25 qr. | July 1 | July 25 | Lehigh Portland Cement | Preferred | $1.75 qr. | June 13 | July 1 |
| Canada Cement Co. | Preferred | $1.62½ qr. | May 30 | June 30 | Leslie-California Salt | Common | $0.20 qr. | June 1 | June 15 |
| Canada Paving & Supply | Preferred | $1.75 qr. | May 15 | June 1 | Lock Joint Pipe | Common | $0.67 M | June 30 | June 30 |
| Calaveras Cement | Preferred | $1.75 qr. | June 30 | July 15 | Material Service | Common | $0.50 qr. | May 15 | June 1 |
| Cleveland Quarries | Common | $0.75 qr. | May 15 | June 1 | McWilliams Dredging | Common | $0.37½ qr. | May 15 | June 1 |
| Consolidated Rock Products | Preferred | $0.44 qr. | May 15 | June 1 | New York Trap Rock | Preferred | $1.75 qr. | June 20 | July 1 |
| Dolese & Shepard | Common | $1.00 qr. | June 30 | July 1 | Pennsylvania Salt | Common | $0.75 qr. | June 30 | July 15 |
| Dufferin Paving & Crushed Stone | 1st Pfd. | $1.75 qr. | June 19 | July 2 | Santa Cruz Portland Cement | Common | $1.00 qr. | June 20 | July 1 |
| Fitzsimons & Connell | Preferred | $1.75 qr. | June 20 | July 1 | Superior Portland Cement | Class A | $0.27½ M | June 23 | July 1 |
| General Aggregates | Common | $0.25 qr. | July 1 | July 15 | Texas Gulf Sulphur | Common | $0.75 qr. | June 1 | June 15 |
| General Asphalt | Common | $0.75 qr. | June 1 | June 15 | United States Gypsum | Preferred | $1.75 qr. | June 15 | June 30 |
| Ideal Cement | Common | $0.75 qr. | June 15 | July 1 | United States Gypsum | Common | $0.40 qr. | June 15 | June 30 |
| International Salt | Common | $0.75 qr. | June 15 | July 1 | Warner Co. | 1st Pfd. | $1.75 qr. | June 15 | July 1 |
| International Portland Cement | Common | $0.25 qr. | ..... | June 30 | Warner Co. | 2nd Pfd. | $1.75 qr. | June 15 | July 1 |
| | | | | | Warner Co. | Common | $0.25 qr. | June 30 | July 15 |

# Review of Foreign Practice

## Proposes Particle Limit in Sieve-Analysis Test

The difficulties in the determination of the result of a sieve analysis are due in part to variations in the method of conducting the analysis, and partly to irregularities in the mesh concerned. The latter variations are particularly important, and were the subject of this study. It is proposed to base the result of the sieve analysis on the particle limits of the sieve concerned rather than on the width of the mesh, since the former size can best be determined both theoretically and practically. The time necessary for attaining complete sieving is the time for the separation of all grains smaller than the particle limit. The sieving time thus determined experimentally is compared with the time required for the passage per minute under a certain size. It is shown experimentally, that the gauging procedure hitherto employed, that is, dimensioning of the mesh, is not a true measure of the fineness of the mesh concerned; this measure can be obtained, however, by determining the particle limit on the basis of counting and weighing. While the graph of a crushed product with the former sieve analysis shows an irregular curve, with determination according to particle limit the curve is uniformly regular. In the determination of the particle limit of a sieve with different materials, the relation of particle limit to mesh width is approximately 0.81 in particularly round material, and with essentially angular material somewhat less.—Dr. Johs. Andersen in *Zement*, 20:224-6 and 242-5, March 5 and 12, 1931.

## New Cement Mill Built as Old Plant Operates

Construction of a new cement plant for the Rodauner Zementfabrik, 16 kilometers from Vienna, was attended by many unusual difficulties. It was built on the site of an older plant, and construction had to be scheduled so that the old plant could operate almost up to the time the new plant was opened. Also, some units of the old plant were to be preserved as standby units, thus complicating the design of the new works. The site, furthermore, is in a narrow valley shutting off expansion on two sides, so that some units of the new plant were rather far removed from each other. Construction was made difficult by a state road, a public promenade, two telegraph lines, a water pipe, a railroad line and the bed of the creek. Among other things, the quantity of earth-moving was greatly increased by the necessity of moving or avoiding the creek and some of the service lines parallel to it.

Since units of the old plant provide an emergency reserve, the plant is designed throughout with very large individual machines rather than several small ones; as the raw materials are limestone and marl, which are easily dried, and as the production of waste-heat was desired, the dry process was adopted. Partly because of the distance separating some of the units, pneumatic conveying is used throughout for the dry materials: raw materials, pulverized coal, and cement. Limestone and marl are crushed at the quarry in a large hammer mill and conveyed to the plant by a bi-cable tramway; at the plant the mixture of stone passes through a 1.8 by 20-meter rotary drier, is ground in a three-compartment dry mill 2.2 meters in diameter and 13 meters long, and is stored in bins in which it can be corrected to the desired chemical composition. The kiln is 50 meters long and 3 meters in diameter, with a widened calcining zone of 5-meter diameter, and has a daily capacity of 270 to 300 tons of clinker. The clinker is cooled in a rotary cooler and conveyed to storage, from which it is reclaimed by a steel belt conveyor running through a tunnel, and carried to a finish mill of the same proportions as the raw mill. Exhaust gases from the kiln, at a temperature of approximately 700 deg. C., go to one of two waste-heat boilers, producing steam for a 2400-kw. turbo-generator. Coal is prepared by two driers and two tube mills. Finished cement is stored in concrete silos, and is sacked for shipment by automatic packing machines. —Dr. K. A. Goslich in *Tonindustrie-Zeitung*, 55:317-320, March 16, 1931.

## Sprayed Mortar Tested for Strength, Density

In a series of tests during 1929 and 1930 to determine the suitability of mortar or concrete placed by spraying by means of compressed air, it was determined that the sprayed mortar gave more favorable results in both strength and density than mortar of the same mix placed by the more common stamping or pouring methods, although the operation itself presents certain difficulties, especially in the rebounding of coarser particles of the aggregate. For practical conditions it is recommended that when sand grading from 0 to 7 mm. is used, not more than 25 per cent. pass through the 900-mesh/sq.cm. screen; with fine sands almost all under 1 mm., not more than 15 per cent. through the 900-mesh sieve. The investigations have shown that high strength and high resistance to permeation can be obtained with moderate cement content.—*Deutsche Kunststein und Zementwaren-Zeitung*, 4:153-4, May 10, 1931.

## Develop Shaking-Trough Conveyors in Germany

Earlier types of shaking-trough conveyors were mainly supported on springs, driven by ordinary cranks, and operated at fairly high speeds, but recently the tendency has been toward low-speed machines which avoid the earlier unfavorable working conditions and the high power consumption, due to the high acceleration of mass on account of high speed. One of the newer types is the "Delta" trough conveyor, patented by the Firma Wilhelm Stoehr of Offenbach, A. M., shown in the accompanying illustrations.

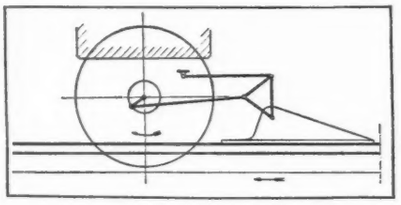


Fig. 1. Drive of the "Delta" shaking-trough conveyor.

The drive of this conveyor consists of a crank-shaft rotating at uniform speed, with two powerful flywheels stabilizing its motion and joined by a connecting-rod to a toggle in triangular form (whence the name "Delta") with three points of attachment: one with the connecting-rod, one with the conveyor trough, and one with a movable counterprop (Fig. 1). By this means the rotary motion of the crank-shaft is converted into a reciprocating motion of the conveyor trough, and the desired speed can be attained by correct proportioning of the sizes of the different parts of the apparatus. The motion of the device is shown schematically in Fig. 2, from which it will be noted that the return stroke of the trough is shorter than that of the forward stroke, and that the velocity of the forward stroke accelerates gradually to a maximum near the end of the stroke so that the material is carried forward by inertia during the return stroke of the conveyor.—Dipl.-Ing. H. Walter in *Zement*, 20:201-2, Feb. 26, 1931.

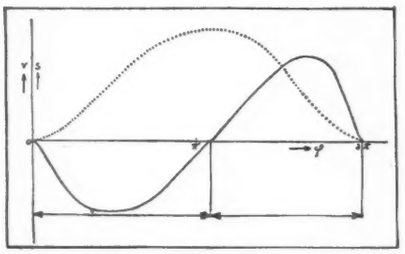


Fig. 2. Operating cycle of the "Delta" conveyor.

# Recent Patents

## AMERICAN

**Excavating**

*Electric-motor-driven excavating machinery.* George J. Lexa and Rolf Ljungkull, Wauwatosa, Wis., assignors to Harnischfeger Corp., Milwaukee, Wis. No. 1,809,981.

**Material-Handling**

*Material-handling machine.* Charles H. Bebinger, Janesville, Wis., assignor to Northern Conveyor & Mfg. Co., same place. No. 1,810,119.

*Dump car.* William L. Burner, Columbus, O., assignor to Western Wheeled Scraper Co., Aurora, Ill. No. 1,810,639.

*Car for transporting cement or the like.* Morris Kind, Bryn Mawr, Pa., assignor to Hercules Cement Co., Philadelphia, Pa. No. 1,810,770.

**Miscellaneous**

*Mining machine.* Morris P. Holmes, Claremont, N. H., assignor to Sullivan Machinery Co., same place. No. 1,810,105.

*Apparatus for aging plastic mixtures.* William H. Brooks and Francis M. Taylor, Birmingham, Ala. No. 1,810,125.

*Injecting and delivering machine for mortar and other materials.* Ernst Fraenkel, Berlin, Germany. No. 1,810,271.

## FOREIGN

**Cement and Concrete**

*Composition for use with concrete, cement and the like, and a method for its production.* F. Guy. British 344,025.

*Apparatus for feeding material to a pump for raising viscous matter such as concrete, cement or the like.* M. Giese and F. Hell. British 344,291.

*Process for improving the hydraulic properties of mixtures of hydraulic and latent hydraulic materials in air storage.* Georg Wieland, Berlin-Zehlendorf, Germany. German 527,756.

*Process for preparation of the raw materials for Portland cement manufacture and the like.* Ernst Curt Loesche, Berlin-Lankwitz, Germany. German 527,869.

**Crushing and Grinding**

*Crushing of ores.* J. G. Clark, Jun. British 343,130.

*Grinding mills.* Babcock & Wilcox, Ltd. British 343,257 and 344,124.

*Plate-shaped crushing surfaces for crushers.* John Waldemar Ericsson, Svedala, Sweden. German 527,829.

**Drilling**

*Hydraulically-operated drilling and other machines.* J. Archdale & Co., Ltd., and J. Jewsbury. British 343,367.

*Supporting device for perforating hammers sliding on a pedestal.* Soc. Metallurgique de Normandie. British 344,334.

*Rock drills.* Siemens-Schuckertwerke Akt.-Ges. British 344,635.

*Implement retainers for pneumatic tools.* W. W. Triggs (Ingersoll-Rand Co.). British 344,689.

*Safety device for deep drilling.* Doheny Stone Drill Co., Los Angeles, Calif. German 528,255.

*Rock drill.* Reginald Asline Bedford, Sheffield, England. Canadian 312,452.

**Drying**

*Method of utilizing the waste heat of moisture in drying-apparatus which are charged and discharged continuously.* W. E. Evans (Madruck Ges. fur Maschinelle Druckentwasserung). British 343,593.

*Driving mechanism for rotary vessels or containers particularly applicable to drylng-cylinders.* Siemens-Schuckertwerke Akt.-Ges. British 343,974.

*Rotary drier, particularly for road-building materials.* Firma Albrecht Reiser, Berlin-Hohenschonhausen, Germany. German 528,233.

*Drier.* Buttner-Werke Akt.-Ges., Uerdingen a. Rh., Germany. German 528,135.

**Excavating**

*Stripping device.* Dipl.-Ing. Dr. Heinz Bernhard and Hermann Frohmuller, Bruckdorf bei Halle, Germany. German 527,470.

*Cable dredger.* Felten & Guilleaume Carlswerk Act.-Ges., Koln-Mueheim, assignee of George Zapf, Cologne, Germany. Canadian 312,591.

**Kilns**

*Rotary kilns.* M. Vogel-Jorgensen. British 343,513.

**Material-Handling**

*Conveyors.* H. C. Blundell. British 342,794.

*Automatic-weight calculators applied to conveyors.* S. C. Brown. British 343,271.

*Elevating and conveyor trucks.* W. P. Sayers. British 343,815.

*Driving mechanisms for endless conveyors.* T. Hill Engineering Co. (Hull) Ltd., and G. F. Hill. British 344,618.

*Bridge for storing and reclaiming materials.* Gesellschaft fur Forderanlegen Ernst Heckel m. b. H., Saarbrucken. German 527,465.

*Shaking-trough and belt conveyor.* Tage Georg Nyborg and Mark Frederick Higgins, Worcester, England. German 528,105.

*Connection for shaking conveyor.* Wilhelm Ackermann, Essen, Germany. German 528,106.

*Variable-speed belt drive.* Frank Oscar Levi Charlton, Bury, England. Canadian 312,467.

*Material agitating and feeding apparatus.* Elmer E. Harper, Kansas City, Mo. Canadian 312,487.

**Mixing**

*Water proportioning device, particularly for concrete mixers.* Karl Peschke, Maschinenfabrik, Zweibrucken i. d. Rheinpfalz, Germany. German 527,851.

*Measuring device for liquids to be supplied to concrete and mortar mixing machine.* Peter Voglsamer, Munich, Germany. Canadian 312,531.

**Sacking**

*Paper bags.* Bates International Bag Co. British 343,447.

*Machines for filling material into containers.* Cornell Multi-Wall Valve Bag Co. British 344,400.

*Paper bags.* Bates International Bag Co. British 318,968.

**Screening and Separating**

*Vibrating sifting-screens.* F. Pirlot. British 343,616.

*Separation of dry materials.* C. W. H. Holmes and Birtley Iron Co. British 343,946.

*Separation of intermixed divided materials.* R. E. White (R. Peale, W. S. Davies and W. S. Wallace). British 343,906.

*Dust separators.* F. W. Wilson and Tilghman's Patent Sand Blast Co. Ltd. British 344,255.

*Centrifugal machines for separating solids and liquids.* F. Dupins and Ateliers J. Hanraz Soc. Anon. British 344,658.

*Separating device.* Roy Edgar Hedberg, Grenfell, Sask. Canadian 312,489.

**Unclassified**

*Treatment of phosphate rock and the like.* Odda Smelteverk Aktieselskapet. British 344,135.

*Process for producing refractory material from basic magnesium carbonate and asbestos.* Luneburger Isoliermattel-und Chemische Fabrik Akt.-Ges., Luneburg, Germany. German 528,134.

PIT AND QUARRY *will furnish, at its actual cost, a copy of any patent cited here. A charge of ten cents per copy is made by the U. S. Patent Office, Washington, D. C., and readers may procure a copy directly by addressing the Commissioner of Patents, with payment for copies requested. Postage stamps are not accepted by the Patent Office. We will endeavor to obtain copies of foreign patents for our readers but we cannot give assurance in every case for the reason that copies of such patents are not printed for distribution as liberally as are the American copies, nor is there a fixed charge per copy.*

## Welding Concern Names Kansas City Distributor

The Fusion Welding Corp., Chicago, Ill., has appointed the Puritan Compressed Gas Corp. of Kansas City, Mo., as distributors for its Weldite line of welding rods. The territory served by the Puritan Compressed Gas Corp. will include the state of Kansas and the western portion of Missouri. Until recently this company has operated as the Kansas City Oxygen Gas Co., one of the oldest companies in the welding-supply business in that section of the country.

# Manufacturers' Publications

*Each publication listed below contains information of interest to non-metallic mineral producers. Readers may obtain, without charge—except where a price may be stated—and without obligation, copies of any of these publications by writing directly to the manufacturers who publish them. Please mention* PIT AND QUARRY *when writing.*

**Bearings**

*The Bantam Ball and Roller Bearing.* 48 p. Illustrated. (Manual No. 11. The Bantam Ball Bearing Co., South Bend, Ind.) Describes and illustrates ball and roller bearings in radial and thrust mountings manufactured by this concern. Thumb indexed for ready reference. Contains engineering data tables.

*Fafnir Ball Bearings.* 12 p. Illustrated. (Condensed Cat. No. 1. The Fafnir Bearings Co., New Britain, Conn.) Describes and illustrates transmission equipment and wide-inner-ring bearings for all industrial purposes. Bull. No. 7 contains complete prices of all types and sizes of bearings.

**Buckets, Clam-shell**

*Haiss Clam-shell Buckets.* (Cat. No. 331. George Haiss Manufacturing Co., Inc., New York, N. Y.) A loose-leaf catalogue describing a series of clam-shell buckets, emphasizing their advantages in (1) power, for excavating, (2) leverage, for digging, and (3) speed, for rehandling materials.

**Couplings, Flexible**

*Resilient Flexible Couplings.* 4 p., 6 ill. (Bull. No. 240. Crocker-Wheeler Electric Manufacturing Co., Ampere, N. J.) Describes and illustrates a flexible coupling employing rubber balls to supply the desired resiliency. Among the advantages claimed are maximum torsional flexibility, great shock-absorbing capacity and trouble-free, noiseless operation.

**Excavators**

"Western's Empire of Sand and Gravel." 2 p., 7 ill. (*The Ground Hog* for May-June, 1931. The Marion Steam Shovel Co., Marion, O.) Describes and illustrates the operations, particularly excavating, at the plants of the Western Indiana Gravel Co. of Anderson, Ind.

*Marion Type 450.* 4 p., 7 ill. (The Marion Steam Shovel Co., Marion, O.) A folder in colors describing a 1¼-cu.yd. excavator available in gas or Diesel-electric power. Illustrations show details of construction.

**Lubrication**

*Bosch Positive, Automatic Forced-Feed Grease Lubrication.* 4 p. Illustrated. (United American Bosch Corp., Springfield, Mass.) Describes and illustratees an automatic method of lubrication to industrial machines employing the forced-feed of greases through pipe-lines to each individual bearing.

*Farval Type C, Automatic System of Lubrication.* 4 p., 7 ill. (Lubrication Devices, Inc., Battle Creek, Mich.) Describes and illustrates a centralized system for lubricating machinery automatically, hydraulic pressure being employed to enable delivery of the lubricant under high pressure.

**Motors**

*Form "A" Induction Motors.* 8 p., 15 ill. (Bull. No. 236. Crocker-Wheeler Electric Manufacturing Co., Ampere, N. J.) Describes and illustrates a motor covering standard ratings of polyphase induction motors and offered in both squirrel-cage and slip-ring types and from one to 75 hp.

**Pipe**

*Armco Spiral Welded Pipe.* 40 p. Illustrated. (The American Rolling Mill Co., Middletown, O.) Describes and illustrates the spiral-welding process and contains specific information to users of pipe from six to 24 inches in diameter in a variety of wall thicknesses.

**Power Transmission**

*Speed Reducer Catalogue.* 128 p. Illustrated. (Horsburgh & Scott Co., Cleveland, O.) Reviews engineering principles involved in the design and selection of speed reducers and describes and illustrates types of worm-gear, herringbone and helical-spur-gear speed reducers. A selection chart gives the number of types which may be used for any given ratio.

**Pumps, Centrifugal**

*Morris Non-Clogging Centrifugal Pumps.* 16 p. Illustrated. (Bull. 139. Morris Machine Wks., Baldwinsville, N. Y.) Describes and illustrates a line of centrifugal pumps, designed especially for industrial and sewage service.

**Refractories**

*Babcock & Wilcox No. 80 Insulating Firebrick.* 4 p., 4 ill. (Bull. R-2. The Babcock & Wilcox Co., New York, N. Y.) Describes and illustrates a silica-alumina firebrick for use in kilns, waste-heat boilers, flues and other industrial purposes.

**Welding**

*Una Arc Welders.* 4 p., 4 ill. (Bull. No. 136. Una Welding & Bonding Co., Cleveland, O.) Describes and illustrates arc-welding outfits for repair work about the plant. Supplied in single or double operator types, and in either portable 2- or 4-wheel models or stationary mountings.

**Grinding**

*Patterson Pebble Mills.* 20 p. Illustrated. (Cat. No. 312. The Patterson Foundry & Machine Co., East Liverpool, O.) Describes and illustrates a line of pebble mills for grinding non-metallic minerals and other materials. Contains specification tables and illustrations showing details of the features of these mills.

## Street Paving Gains

*(Continued from page 67)*

in the smaller cities of the group studied. Most of the brick, block, and stone was laid in the largest cities and in the smallest.

Attention is called to the fact that the various materials used for street paving—asphalt, Portland cement, vitrified brick, stone block, and wood block—are not necessarily competitive but that to a large extent they supplement each other. Thus sheet asphalt is used as a surface course over a base of Portland-cement concrete, vitrified brick, or stone block. Asphaltic concrete and sheet asphalt are used to patch and resurface worn pavements of Portland-Cement concrete, vitrified brick, or stone. Liquid asphalt and asphaltic joint-filler are used to fill joints, crevices, and cracks in Portland-cement concrete, brick, or stone pavements. Portland-cement concrete and vitrified brick are used for gutters, curbs, and shoulders to bituminous roadways, as well as for bases for asphaltic surfaces and Portland-cement concrete has been used for patching and resurfacing cement, brick, and stone block pavements.

A distinct gain in mileage of pavements and surfaces for state highways as contrasted with earth and untreated roads is shown in the 1931 estimates of mileage constructed as compiled by the statistical department of the American Road Builders' Association.

A comparison of 1931 estimates with 1930 figures for mileage of various types of state highways shows: graded roads, 10,249 in 1931 and 11,148 in 1930; treated and untreated sand-clay, gravel and macadam, 18,426 in 1931 and 17,203 in 1930; asphalt, concrete and brick, 11,735 in 1931 and 11,133 in 1930. The total mileage estimated for 1931 is 40,410 as compared with 39,484 in 1930. Contracts awarded for the first three months of 1931 were $181,637,138 for state-highway work as compared with $114,101,383 for the same period in 1930.

In April state and federal aid contracts were awarded amounting to $96,879,468; May was around $70,000,000. Reports from the New York state highway department show 18,000 men employed on highway construction in the state as compared with 7,000 employed at the same time last year. State highway contracts amounting to around $30,000,000 were let in New York up to June 1 which is $9,000,000 more than were let up to the same time last year.

# Insurance Problems Discussed

## Auto Loss Settlements

THERE would be few difficulties over the adjustment of automobile losses if it were not for the problem of depreciation. By this we do not imply that such losses are hard to settle, because in the great majority of cases both the insured and the adjuster are willing to face the facts fairly. But where differences of opinion do arise, the reason most often is that one party or the other has a false notion of the value of the car. We are therefore extending the discussion of insurable value in the last issue to show how this works out under the various forms of fire, theft and collision policies.

### Over-Insurance

Possibly the ordinary automobile fire and theft policy would be better understood if we remembered that its wording is the same as that of a fire insurance policy. If you insured a $10,000 building for $15,000 you would certainly receive only $10,000 in case of fire. In theory automobile losses are handled the same way and if you insure a car for more than it is worth in the open market you will collect only the actual value. That is the purely legal aspect. In practice, of course, the insurance company does incur some moral responsibility if it accepts an order calling for a certain amount of insurance and then collects a premium based on this amount.

### Three Remedies Tried

Insurance companies have tried three different lines of attack to try to remove this source of friction. The old policy form, under which the insured selected an amount of insurance that was not a guaranteed settlement but merely a maximum limit of liability in case of loss, is losing its popularity in favor of the three new forms which are known as the "valued" policy, the "actual-value" policy and the "automatic-monthly-depreciating" policy. With a few exceptions no single company issues all of these forms, so that to some extent the question of policy form is tied up with the solvency and general status of the insurer. The effect of these three forms on loss adjustments will be detailed in the following paragraphs.

### Guaranteed Value

The valued form seems superficially to be the easiest solution. It says that in case of the total loss of your car by fire or theft you will be paid the face amount of the policy, regardless of whether the car is worth that much. To the thoroughly honorable man, this sounds perfect; there is no argument—he just gets the amount he paid for. It is not within the province of this magazine either to recommend or reject the "valued" policy, but in listing its advantage of simplicity it is fair to caution our readers as to the other side of the story. One of the large motor clubs, which makes its principal business selling insurance, uses the "valued" feature as its chief sales argument—"you get what you pay for," they say. But down in the fine print of the policy is a line that says the motor club has the right to replace the lost car instead of paying cash. Now you defeat the whole purpose of the guaranteed value with this line, because under it the insurer need never pay out more than the cost of a second hand car. Another trouble sometimes encountered under the valued policy concerns partial losses. If your car is not totally destroyed, the insurance company just has to repair the damage and put it back in order. If the company is overpaying its total losses (which is usually the case) it may make up the difference by being "tight" on partial losses, so as to bring its aggregate losses down to the average. We do not suggest that all companies do this, but the risk is so obvious that it should warn any buyer to examine the reputation of his company as to liberality on small claims.

### "Actual Value"

The old line stock companies first attempted to meet the competition of "valued" policies by issuing the "actual value" policy. This contract does not name any specific amount of insurance, but in return for a flat premium the company agrees to pay whatever is the actual value of the car at the time loss occurs. This policy form is very popular with many insurance men, especially in smaller towns. Its merit is that it eliminates all argument about the amount of insurance to be put into the policy and if there is no loss the sailing is easy. However, if the car is burned or stolen, this form simply passes the argument from the policy writer over to the adjuster, and in many cases the insured can "boost" the company's payment by holding out for the amount named in a specific policy.

### Monthly Depreciation

The newest policy form seems to approximate the advantages of all the others. It is called the "automatic-monthly-depreciating" policy. Although it does not guarantee a fixed indemnity, it is written for the current value of the car and the face of the policy is reduced two and one-half per cent a month. This is just about the rate at which the average car depreciates and therefore you may consider that you will collect very close to the current face of the policy at all times. The policy has the further advantage of costing ten per cent less than the others.

### Partial Losses

Probably the most important aspect of automobile loss adjustments gets no comment from insurance salesmen. We worry a great deal about what we will collect if the car suffers a total loss, but we overlook the fact that most losses are only partial. Most cars that are burned can be repaired, and most stolen cars are recovered, usually in a damaged condition. All of the policy forms discussed above are identical in their treatment of partial losses. They agree to indemnify the insured for his actual loss, but include no specific guarantees. There are two perplexing problems on partial damage. Suppose your car is stolen and later recovered with one wheel broken. Will the insurance company give you a new wheel, a second-hand wheel, or cash equal to the cost of a new wheel minus depreciation? In the second place, if the damage involves such an item as a scratch or dent, will the insurance company repaint the whole car or just touch up the damaged spots? Legally the company is within its rights in getting by the cheapest way, but as a matter of good business some companies are very liberal with partial damage. This is one of the most important aspects of buying automobile insurance. You will not find it in any policy form and can only investigate the general reputation of the various claim departments.

---

## Euclid Crane & Hoist Announces Name Change

The Euclid Crane & Hoist Co. of Cleveland, O., announces that its name has been changed to Euclid-Armington Corp. as of July 1, 1931. The road-machinery division of The Euclid Crane & Hoist Co. will conduct its business under the name of The Euclid Road Machinery Co., Division of Euclid-Armington Corp.

The officers and personnel of The Euclid-Armington Corp. remain the same as before the change. Communications formerly addressed to the road-machinery division of The Euclid Crane & Hoist Co. should, in the future, be addressed to The Euclid Road Machinery Co., Chardon Road, Cleveland, O.

---

## Sand-Lime-Brick Plant Planned at Los Angeles

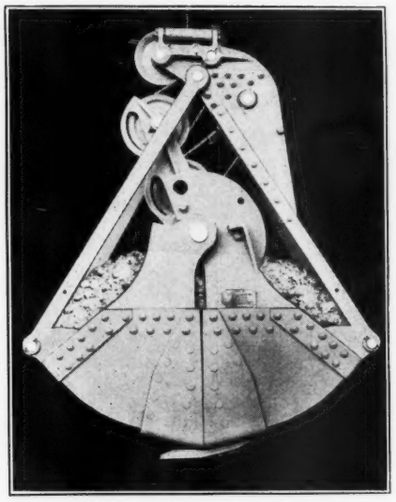
The Pacific Hardstone Brick Corp. of Los Angeles will erect a new plant for the manufacture of sand-lime brick. About $200,000 will be invested in buildings and equipment, it is declared.

# New Machinery and Supplies

## Clam-shell Bucket Has Greater Digging Power

The success of the G. H. Williams Co. in developing a clam-shell with the greatest possible digging power is shown by the results that users are getting. In work such as handling of coarse broken stone, and hard excavating, the new "Champion" has shown penetrating power that goes beyond anything they have had. As a result, the Williams Co. is placing a new "Champion" bucket on any material-handling or excavating work with the definite guarantee to show increased digging power.

The digging power of this clam-shell bucket is due to many improvements now used, together with the original lever- arm principle, providing straight cable leads, which reduces friction on all bearings to a minimum. Even the slightest "side lead" of the closing



The new model clam-shell bucket.

cable is eliminated. This also saves wear on sheaves, shafts, and cable. Straight cable leads permit a high percentage of the closing-line energy to be utilized for actual digging.

Additional closing leverage is gained in the new bucket by the use of extended corner brackets, which project well beyond the backs of the scoops. A narrower head of cast steel provides rigid resistance to twisting strains in the hardest digging. The extra-long roller guards of a new type, and large transverse roller protect the cable in all directions.

Each corner pin has a T-head that fits into a slot in the corner bracket, preventing turning as the bucket opens and closes, minimizing wear on the corner bar bushings and holding them in perfect alignment.

In addition to unusual digging results with the new clam-shell, users are reporting important savings in cable costs and reduced bucket maintenance. In many cases, worth-while savings in cost of explosives have been made, due to the exceptional digging power developed.

A new bulletin giving a complete description of the new Williams "Champion" can be obtained by writing the G. H. Williams Co., at its main office at Erie, Pa., or its branch offices in Cleveland, New York, Chicago, Pittsburgh, or Detroit.

---

## Blast-Hole Drill Model Has Many Improvements

Designed especially for blast-hole work, the improved No. 44 Loomis Clipper drill, manufactured by the Loomis Machine Co., Tiffin, O., is finding favor with scores of quarry operators.

The No. 44 drill is made with either wood or steel frame and can be supplied with crawlers, both front and rear, or with crawler rear wheels and regular front wheels. Electric, gasoline or steam power is available. This improved drilling machine is intended primarily to drill blast holes up to 8 in. in diameter, with either manila or wire line to the maximum depth for blast-hole work. It is, however, capable of drilling as deep as 1,100 ft. and deeper, using all or part wire rope.

The drill is noted for its ease and quickness of operation, as well as its efficient spudding stroke. The loose crank is a patented feature, starting and stopping the tools instantly by simply pushing a lever. The band-friction clutch on the drilling crank is a lined metal band having a single-nut adjustment. The clutch can be easily relined if necessary, and is quick to respond and efficient in any weather. A patented rope-saving device located in the rear end of the spudding beam tends to eliminate the burning of the cable at the point where it leaves the drum.

All changes while drilling with the No. 44 Clipper are made with lightning speed. Should it be necessary to draw the tools out of the well for any purpose whatever, it is not necessary to stop the machine and take ropes off a lot of pulleys or throw cogwheels in or out of mesh. The spudding beam is stopped instantly and the tools are on the way up without loss of a second of time. These operations are all done by the driller as he stands in position in front of the machine. The drilling rig has a low center of gravity, giving it working and traveling stability in places which seem to be almost inaccessible for drilling operations. It has one speed forward—unless two are specified—and one reverse. Axles are of all-steel construction, while castings are either steel or semi-steel. Of the three revolving shafts on the front end only one runs except when raising or lowering tools in or out of the hole.

The improved blast-hole drill.

Additional information regarding the No. 44 Clipper may be obtained by addressing the Loomis Machine Co., Tiffin, O.

---

## New Agitator and Truck Mixer Placed on Market

The National Equipment Corp., Milwaukee, Wis., with a background of over thirty years' experience in designing mixers for every type of concrete work, announces the Smith truck mixer and agitator. This unit, incorporating many points of unique design, has the following important features:

A thorough five-step mixing action, accomplished by clock-wise rotating and *without reversing direction.*

Distinctive egg-shaped drum with twelve-sided panel design.

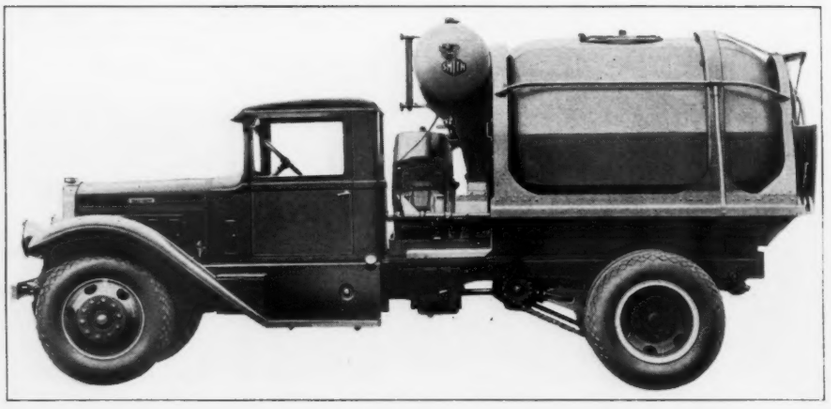
Full control of discharge—fast, slow or intermittent. Positive discharge—no hoisting or tilting of the drum.

Adaptable to any make of truck of sufficient capacity.

Separate power unit providing longer life of truck and better control.

Roller and ball bearing drum support.

Simplicity and ruggedness of design—saving of weight and unnecessary mechanism.



New truck mixer and agitator.

The machine is offered in two sizes. The 1 to 1½ cu.yd. has a capacity of 1 cu.yd. of resultant concrete as a mixer and 1½ cu.yd. as an agitator. The 2 to 3 cu.yd. mixer has a capacity in resultant concrete of 2½ cu.yd. and 3 cu.yd. as an agitator. A third size, with a capacity up to 4½ cu.yd. of concrete, will soon be available also.

An illustrated bulletin and complete information can be had on request either from the National Equipment Corp. at Milwaukee or any of its sales representatives.

## Welders' Goggles Shaped to Give Wearer Comfort

The Linde Air Products Co., New York, N. Y., has recently introduced a new type of welders' goggles, designated as Oxweld No. 12 goggles. This improved type embodies features seldom found in safety appliances of this kind.

Absolute comfort is assured since they are designed to fit the eyes and are adjustable to conform to the individual nose. The edge of the cup coming in contact with the face is shaped to conform to the general contour of the welder's cheekbone and nose, thus fitting smoothly around the eyes. The eye-pieces are joined with a leather strap, adjusted by means of a metal buckle, so that they may be correctly spaced to the width of the face.

Ventilation has been carefully considered in designing these goggles. Patented ventilation ports on each side of the eye-cups are so constructed that it is impossible for sparks or light to reach the inside of the cup. The depth of the cup is another feature, permitting ample circulation of cool air.

Wide vision welders' goggles.

The field of vision has been increased by the use of 50 mm. diameter lenses instead of the usual 47 mm. lenses. Brown color lenses, known as the "B" type, are available as with older type goggles, and in addition, a new special quality green lens, known as the "A" type, is available in three different shades. Lenses may be easily changed by simply removing the metal cups which unscrew from the frames of the eye-pieces.

The material of which these goggles are made differs from that used in any other eye protector. It is a molded plastic substance known as Oxweldite which is formed over a fabric base and is resistant to heat, light and electric current. The entire construction of these goggles is such that they will readily withstand the usage to which goggles are subjected in welding shop or plant.

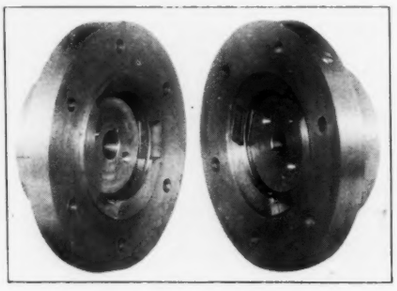
## Flexibility in Coupling Is Entirely Mechanical

A mechanical coupling of extreme flexibility, using the age-old principle of ball-and-socket motion and providing 100 per cent. driving contact in all positions, is offered pit, quarry and plant operators in the Davis flexible coupling. It is manufactured by the Penn Machine Co., Johnstown, Pa.

Simple and rugged in construction with no springs, gears, bushings or perishable washers to break or wear out, the Davis flexible coupling takes a great degree of misalignment and gives reliable and efficient service for a long period of time with little attention.

Every requirement of operation is successfully met by Davis flexible couplings. Their flexibility is entirely mechanical, they are self-aligning, and quiet in operation. Protection is afforded the bearings and shafts of the connected units. Free lateral float to the connected machines is allowed without transmitting it. Their double engagement construction eliminates crank or whip action and years of trouble-free service is assured with no attention other than occasional oiling.

Davis flexible couplings are made entirely of high-carbon forged steel, accurately machined to insure proper balance. The balls and socket keys are case hardened and ground to the correct size. Each coupling is thoroughly inspected before shipment and guaranteed against defective materials and workmanship. They are designed for every type of drive and load condition in all industries. Both shrouded and exposed-type couplings are manufactured. Couplings to meet unusual operating conditions can be furnished.



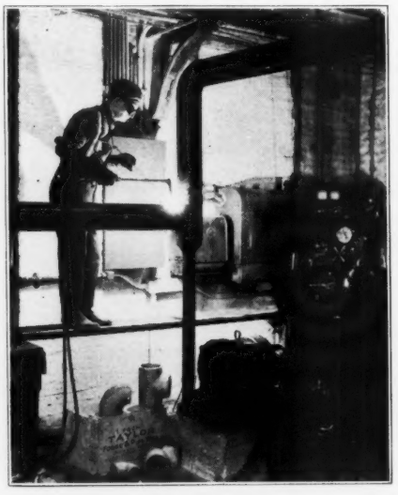
Open view of the coupling.

Upon request, the company's engineering staff will be glad to study any plant's coupling problems and make suitable recommendations.

## New Fittings Facilitate Welding of Pipe-lines

The Taylor Forge & Pipe Works, Chicago, has developed a complete line of seamless-steel pipe fittings for welding, consisting of elbows, tees, reducing tees, bull plugs, and reducing nipples, as well as forged-steel butt-welding flanges which have already been on the market for over three years. All sizes to 24 in., inclusive, will be ready for distribution within the near future but, at present, only sizes 12 in. and smaller are available. The tees are made in sizes 2 in. to 8 in.

This line of seamless pipe fittings for welding is unique in many respects.



Fabricating an industrial pipe-line with welded fittings.

It permits entire pipe systems fabricated by welding to be installed with only the use of true circumferential welds acknowledged to be the easiest to make, resulting in increased efficiency of the welder, and full strength welds. Erection is considerably simplified. The fittings are lighter in weight than cast-steel fittings, and, therefore, require fewer and lighter supports. They require less space in erection, and, in addition, permit easy and economical insulation. The manufacturing methods are on a mass production basis, employing patented processes to a great extent. The elbows are made without thinning or buckling of the walls, and further have the advantageous feature of and accurate lining up. Elbows are short tangents to facilitate welding made of the standard center-to-end measurement of American standard extra heavy screwed fittings, and with end-to-center-to-end dimension equal to one and one-half times the nominal pipe diameter. The ends are machine tool beveled, providing a smooth, clean surface for welding, and assuring maximum accuracy as well as installation ease.

The tees are made to pipe thickness at the ends, with the body thickened up, especially around the outlet, to give required reinforcement. The basis of design for the tee, as well as the other welding products, has been to make the fittings of an installation of welded fabricated pipe the strongest parts of the line. Flow or friction has also been carefully considered in design. The tees have sweep outlets, a feature especially important for lines of high velocity.

It is expected that with perfectly designed forge tees now available, the former practice of welding one pipe into another to form a tee will be eliminated; this crude practice has always been objectionable to engineers and architects because no one except the welder himself knew how far the branch pipe extended into the run, and consequently serious impaired flow conditions were the inevitable result. From the standpoint of strength, it can be said that the tee weld made by welding pipe together at right angles, receives the greatest stress in a line, yet it is the most difficult weld to make, and being difficult the weld is often very poor and porous.

## Fiber Cap Guards Head of Quarry, Mine Worker

A new protective cap, known as the Skullguard, for quarry and mine workers, has been perfected and placed on the market by the Mine Safety Appliance Co. of Pittsburgh, Pa.

The crown of the micarta shell is reinforced and the entire cap is a nonconductor of electricity. It is said to be durable, waterproof, acid resisting and built for a long life of service.

The peak is rigid, with little flexibility, offering face and eye protection from falling materials. The reinforced edge of the cap is flared to protect the ears.

A substantial lampholder, fastened to the shell with three insulated rivets, is made to carry the most common types of lamps at the correct angle for

Safety cap for quarry workers.

best light distribution. The lampholder can be arranged to accommodate any type of lamp specified.

The soft, tough, sweat-proof leatherette lining is cushioned with four felt pad spacers, placed so as to provide proper ventilation and comfort. Six ventilation holes are also provided in the crown.

## Small Pulverizer Grinds Either Dry or Wet Coal

The emphasis placed on the economical use of pulverized-coal by small and medium-sized industrial boiler-plants has resulted in the need of a coal pulverizer that has the same relative performance and reliability demanded of higher-capacity pulverizers in the larger stations. To meet these requirements the Fuller Lehigh Co., 85 Liberty St., New York, N. Y., has developed and placed on the market a new pulverizer known as the Fuller Lehigh Type C pulverizer.

The design of this mill includes the ball-and-grinding-ring principle of pulverizing. This is an especially desirable feature in mills of small capacities because by its use fineness of the pulverized coal is not affected by wear of the grinding parts. The coal is pulverized by large-diameter balls grinding under pressure between upper and lower grinding rings. The pressure between the grinding parts is applied and maintained by a heavy steel spring mounted in the top section of the mill.

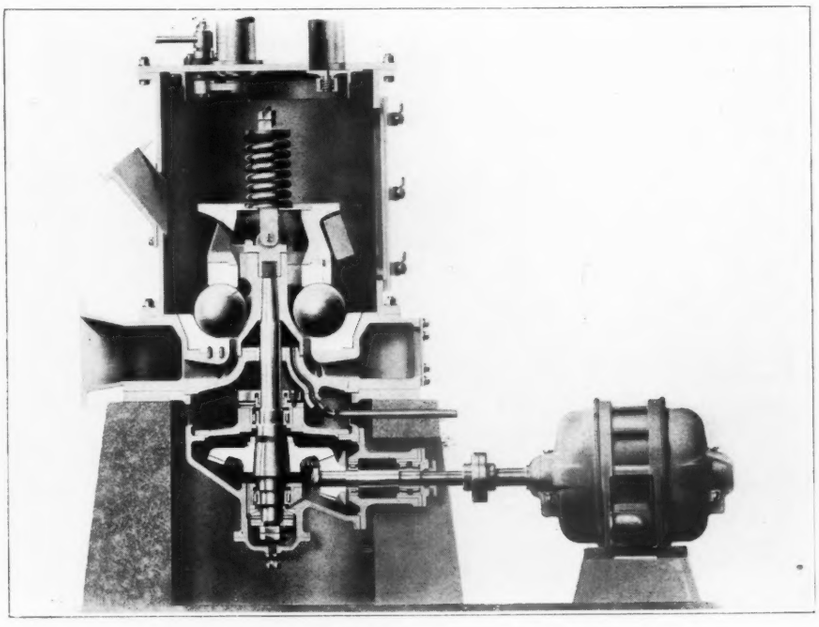
The mill also is well suited for pulverizing coals of different grindabilities since the grinding pressure can be adjusted to suit the hardness of the coal.

The balls in the Type C pulverizer wear spherically and uniformly, and together with the grinding rings have long life, since these parts are unusually resistant to abrasion and have no metal-to-metal contact.

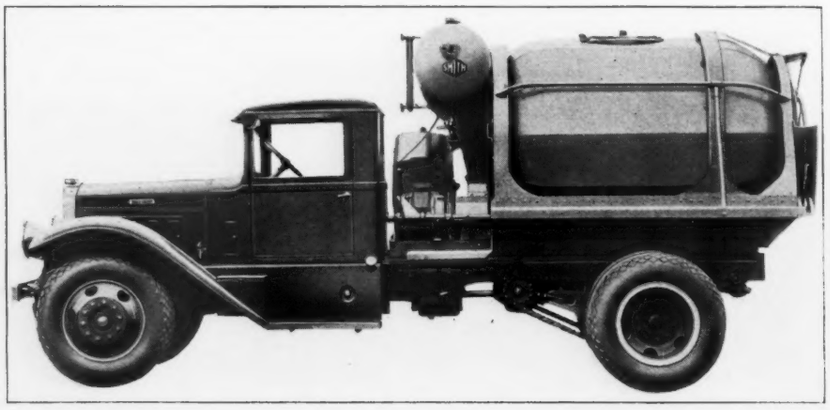
Wet coal can be pulverized in the Type C pulverizer when preheated-air is used for separation of the fines. Since the coal is dried by the hot air as it flows through the mill, it is unnecessary to install separate drying equipment for this purpose.

The Type C pulverizer is easy to control, for the mill runs at a constant speed and requires only a few adjustments whenever the steaming capacity of a boiler is changed. A change in capacity is made by simply varying the rate of the coal-feed to the mill and the mill responds quickly to such changes, but not so quickly that undesirable fluctuations occur at the pulverized-coal burner.

Raw coal, crushed to pass through



Cross-section through the Type C pulverizer.



New truck mixer and agitator.

The machine is offered in two sizes. The 1 to 1½ cu.yd. has a capacity of 1 cu.yd. of resultant concrete as a mixer and 1½ cu.yd. as an agitator. The 2 to 3 cu.yd. mixer has a capacity in resultant concrete of 2½ cu.yd. and 3 cu.yd. as an agitator. A third size, with a capacity up to 4½ cu.yd. of concrete, will soon be available also.

An illustrated bulletin and complete information can be had on request either from the National Equipment Corp. at Milwaukee or any of its sales representatives.

## Welders' Goggles Shaped to Give Wearer Comfort

The Linde Air Products Co., New York, N. Y., has recently introduced a new type of welders' goggles, designated as Oxweld No. 12 goggles. This improved type embodies features seldom found in safety appliances of this kind.

Absolute comfort is assured since they are designed to fit the eyes and are adjustable to conform to the individual nose. The edge of the cup coming in contact with the face is shaped to conform to the general contour of the welder's cheekbone and nose, thus fitting smoothly around the eyes. The eye-pieces are joined with a leather strap, adjusted by means of a metal buckle, so that they may be correctly spaced to the width of the face.

Ventilation has been carefully considered in designing these goggles. Patented ventilation ports on each side of the eye-cups are so constructed that it is impossible for sparks or light to reach the inside of the cup. The depth of the cup is another feature, permitting ample circulation of cool air.

Wide vision welders' goggles.

The field of vision has been increased by the use of 50 mm. diameter lenses instead of the usual 47 mm. lenses. Brown color lenses, known as the "B" type, are available as with older type goggles, and in addition, a new special quality green lens, known as the "A" type, is available in three different shades. Lenses may be easily changed by simply removing the metal cups which unscrew from the frames of the eye-pieces.

The material of which these goggles are made differs from that used in any other eye protector. It is a molded plastic substance known as Oxweldite which is formed over a fabric base and is resistant to heat, light and electric current. The entire construction of these goggles is such that they will readily withstand the usage to which goggles are subjected in welding shop or plant.

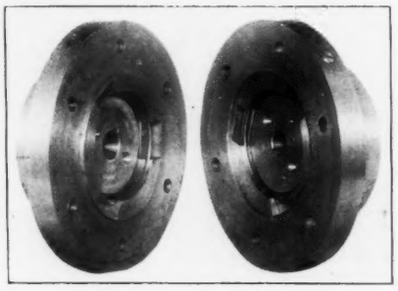
## Flexibility in Coupling Is Entirely Mechanical

A mechanical coupling of extreme flexibility, using the age-old principle of ball-and-socket motion and providing 100 per cent. driving contact in all positions, is offered pit, quarry and plant operators in the Davis flexible coupling. It is manufactured by the Penn Machine Co., Johnstown, Pa.

Simple and rugged in construction with no springs, gears, bushings or perishable washers to break or wear out, the Davis flexible coupling takes a great degree of misalignment and gives reliable and efficient service for a long period of time with little attention.

Every requirement of operation is successfully met by Davis flexible couplings. Their flexibility is entirely mechanical, they are self-aligning, and quiet in operation. Protection is afforded the bearings and shafts of the connected units. Free lateral float to the connected machines is allowed without transmitting it. Their double engagement construction eliminates crank or whip action and years of trouble-free service is assured with no attention other than occasional oiling.

Davis flexible couplings are made entirely of high-carbon forged steel, accurately machined to insure proper balance. The balls and socket keys are case hardened and ground to the correct size. Each coupling is thoroughly inspected before shipment and guaranteed against defective materials and workmanship. They are designed for every type of drive and load condition in all industries. Both shrouded and exposed-type couplings are manufactured. Couplings to meet unusual operating conditions can be furnished.



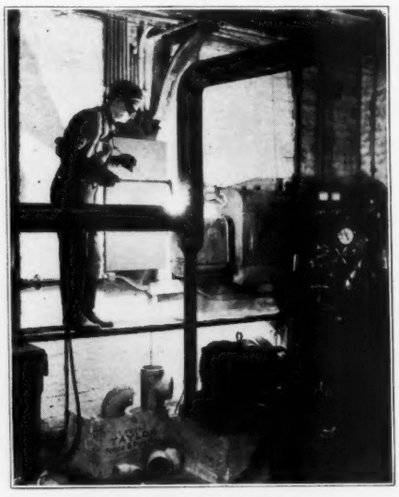
Open view of the coupling.

Upon request, the company's engineering staff will be glad to study any plant's coupling problems and make suitable recommendations.

## New Fittings Facilitate Welding of Pipe-lines

The Taylor Forge & Pipe Works, Chicago, has developed a complete line of seamless-steel pipe fittings for welding, consisting of elbows, tees, reducing tees, bull plugs, and reducing nipples, as well as forged-steel butt-welding flanges which have already been on the market for over three years. All sizes to 24 in., inclusive, will be ready for distribution within the near future but, at present, only sizes 12 in. and smaller are available. The tees are made in sizes 2 in. to 8 in.

This line of seamless pipe fittings for welding is unique in many respects.



Fabricating an industrial pipe-line with welded fittings.

It permits entire pipe systems fabricated by welding to be installed with only the use of true circumferential welds acknowledged to be the easiest to make, resulting in increased efficiency of the welder, and full strength welds. Erection is considerably simplified. The fittings are lighter in weight than cast-steel fittings, and, therefore, require fewer and lighter supports. They require less space in erection, and, in addition, permit easy and economical insulation. The manufacturing methods are on a mass production basis, employing patented processes to a great extent. The elbows are made without thinning or buckling of the walls, and further have the advantageous feature of and accurate lining up. Elbows are short tangents to facilitate welding made of the standard center-to-end measurement of American standard extra heavy screwed fittings, and with end-to-center-to-end dimension equal to one and one-half times the nominal pipe diameter. The ends are machine tool beveled, providing a smooth, clean surface for welding, and assuring maximum accuracy as well as installation ease.

The tees are made to pipe thickness at the ends, with the body thickened up, especially around the outlet, to give required reinforcement. The basis of design for the tee, as well as the other welding products, has been to make the fittings of an installation of welded fabricated pipe the strongest parts of the line. Flow or friction has also been carefully considered in design. The tees have sweep outlets, a feature especially important for lines of high velocity.

It is expected that with perfectly designed forge tees now available, the former practice of welding one pipe into another to form a tee will be eliminated; this crude practice has always been objectionable to engineers and architects because no one except the welder himself knew how far the branch pipe extended into the run, and consequently serious impaired flow conditions were the inevitable result. From the standpoint of strength, it can be said that the tee weld made by welding pipe together at right angles, receives the greatest stress in a line, yet it is the most difficult weld to make, and being difficult the weld is often very poor and porous.

## Fiber Cap Guards Head of Quarry, Mine Worker

A new protective cap, known as the Skullguard, for quarry and mine workers, has been perfected and placed on the market by the Mine Safety Appliance Co. of Pittsburgh, Pa.

The crown of the micarta shell is reinforced and the entire cap is a nonconductor of electricity. It is said to be durable, waterproof, acid resisting and built for a long life of service.

The peak is rigid, with little flexibility, offering face and eye protection from falling materials. The reinforced edge of the cap is flared to protect the ears.

A substantial lampholder, fastened to the shell with three insulated rivets, is made to carry the most common types of lamps at the correct angle for best light distribution. The lampholder can be arranged to accommodate any type of lamp specified.

Safety cap for quarry workers.

The soft, tough, sweat-proof leatherette lining is cushioned with four felt pad spacers, placed so as to provide proper ventilation and comfort. Six ventilation holes are also provided in the crown.

## Small Pulverizer Grinds Either Dry or Wet Coal

The emphasis placed on the economical use of pulverized-coal by small and medium-sized industrial boiler-plants has resulted in the need of a coal pulverizer that has the same relative performance and reliability demanded of higher-capacity pulverizers in the larger stations. To meet these requirements the Fuller Lehigh Co., 85 Liberty St., New York, N. Y., has developed and placed on the market a new pulverizer known as the Fuller Lehigh Type C pulverizer.

The design of this mill includes the ball-and-grinding-ring principle of pulverizing. This is an especially desirable feature in mills of small capacities because by its use fineness of the pulverized coal is not affected by wear of the grinding parts. The coal is pulverized by large-diameter balls grinding under pressure between upper and lower grinding rings. The pressure between the grinding parts is applied and maintained by a heavy steel spring mounted in the top section of the mill.

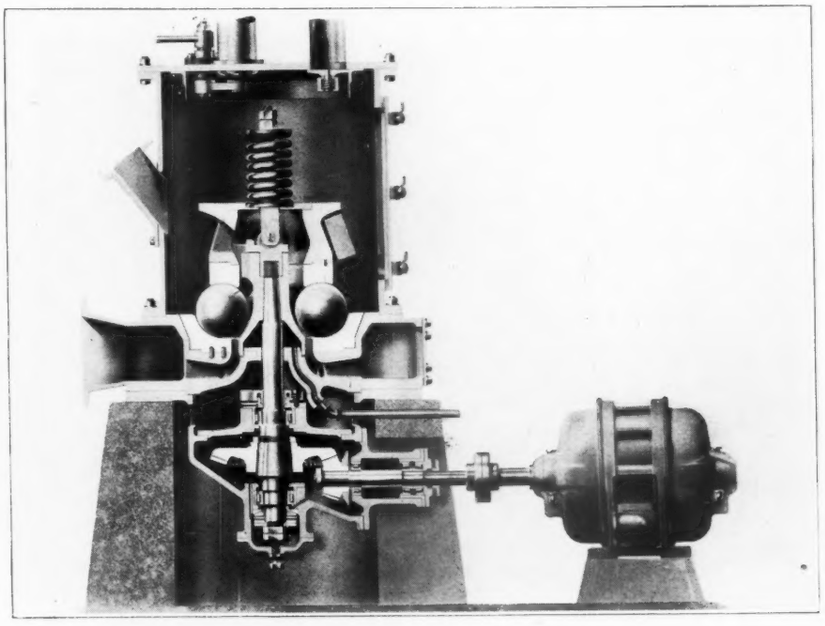
The mill also is well suited for pulverizing coals of different grindabilities since the grinding pressure can be adjusted to suit the hardness of the coal.

The balls in the Type C pulverizer wear spherically and uniformly, and together with the grinding rings have long life, since these parts are unusually resistant to abrasion and have no metal-to-metal contact.

Wet coal can be pulverized in the Type C pulverizer when preheated-air is used for separation of the fines. Since the coal is dried by the hot air as it flows through the mill, it is unnecessary to install separate drying equipment for this purpose.

The Type C pulverizer is easy to control, for the mill runs at a constant speed and requires only a few adjustments whenever the steaming capacity of a boiler is changed. A change in capacity is made by simply varying the rate of the coal-feed to the mill and the mill responds quickly to such changes, but not so quickly that undesirable fluctuations occur at the pulverized-coal burner.

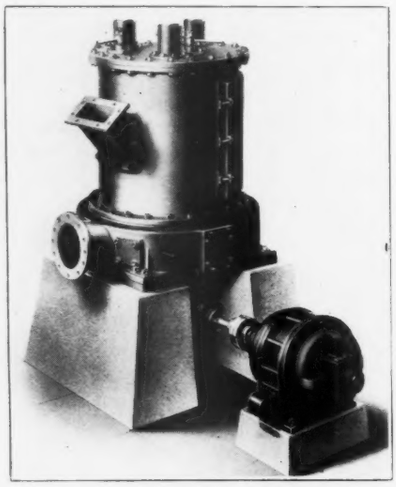
Raw coal, crushed to pass through



Cross-section through the Type C pulverizer.

a ¾-in. ring, is fed to the mill from an overhead bunker by means of a table-type feeder. The coal, after entering the mill through the coal-inlet spout, drops into the path of the grinding balls, where it is pulverized.

Tramp iron or other foreign material that may pass into the mill with



The new Type C pulverizer.

the coal is at once rejected outward from the grinding zone by the grinding balls, and can be removed through the large access door in the top section.

The air, for separating the coarse particles of coal from the fines, enters the mill under pressure through the air inlet in the intermediate section. The air currents pass through this section into the annular passage between the stationary grinding-ring and the driving-yoke and, as they flow upward, they pick-up the particles of finely pulverized coal and remove them from the grinding zone.

The pulverized-coal and air streams continue their upward movement whence they are discharged through ports in the rotating spider. An overhanging flange, cast around the top of the spider, prevents the streams from rising to the top of the mill until they are first projected outward and subjected to the classifying action of the spider as it rotates. Here the coarse particles of coal are separated from the fines and drop back into the grinding zone for further pulverizing, while the streams of finely pulverized coal and air continue to the top of the mill and are discharged directly to one or more burners.

Fuller-Lehigh Type C pulverizers are available in several sizes, and in capacities ranging from 1 to 6 tons of coal per hour.

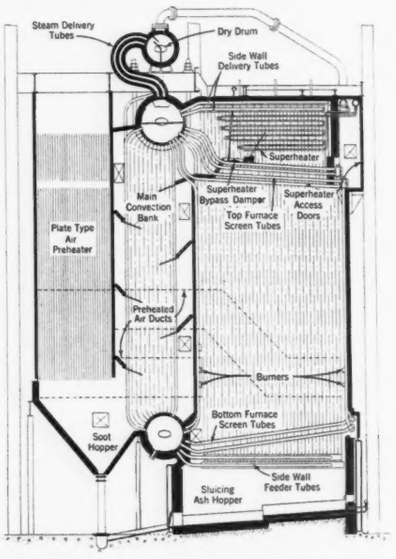
## Steam-Generating Unit Complete Boiler Plant

Combustion Engineering Corp., New York, N. Y., is now offering the combustion steam generator, a standard steam-generating unit built in various sizes and providing a wide range of capacities at any desired conditions of steam temperature and pressure. Detail designs have been completed for eight sizes with capacities ranging from 70,000 to 400,000 lb. of steam per hour, from and at 212 deg. F.

As shown in the accompanying illustration, this design combines in one unit all the elements required for fuel-burning, steam generation and superheating, heat recovery and ash disposal. Those familiar with the development of pulverized-fuel-firing and the history of steam-generating practice will note that there are no novel or radical departures from fundamentals, but rather that the design represents a highly compact and simple arrangement of long and well-established elements. They will also note the apparent absence of the maze of pipes, headers, etc., exterior to the boiler casing, with which such construction has become associated in their minds. These pipes and headers essential for completing the circulating system of water walls are located entirely within the casing, where, in addition to performing their normal function as circulators, they also serve as highly effective heat absorbing surface.

A point of particular interest, is the entire absence of openings through the casing. Such openings are ordinarily required for the ingress and egress of wall tubes and headers. They are never perfectly sealed and consequently permit the discharge of dust during soot-blowing operations, as well as the inflow of air during normal operation. The Combustion steam-generator casing is air-tight and dust-tight throughout.

All four walls of the furnace are water-cooled, each wall being com-




Sectional side elevation of the combustion steam generator.

posed of a solid row of tubes with only sufficient space between them for construction requirements. The water-wall feeder and delivery tubes, at the bottom and top of the furnace respectively, complete the heating surface of the furnace proper nearly all of which is exposed to radiant as well as convection heat.

The result of this arrangement of wall tubes and circulators is a furnace built completely of water tubes to the exclusion of exposed refractories and having the maximum attainable quantity of contained water with provision for the highest possible freedom of circulation.

This type of furnace is perfectly adapted to the type of firing used, i. e., —the corner-tangential system which produces intense turbulence with extreme rapidity of combustion and correspondingly high temperatures, — these high temperatures being the result (not the cause) of the high rates of combustion.

Another feature of interest is the superheater by-pass damper which affords a unique and much needed means of controlling superheat temperature. Adequate space is provided for the superheater which is so located in the assembly as to permit of simple supports and a degree of accessibility unusual in boiler construction.

The first unit of this new design to be installed in America has now been in operation for several months in the plant of a leading industrial company. In overall results and ease and dependableness of operation, its performance has set an exceptionally high standard.

## New Corporations

WILLIAM GALL CRUSHER CO., Ableman, Wis. $25,000. William Gall, Sr., G. H. Volz and William Gall, Jr. Crushing, quarrying and road building.

WATERBURY CRUSHED STONE CO., Waterbury, Conn. $200,000. Daniel T. Allen, pres., and Maurice T. Healey, Jr., sec.-tr.

MINBRES VALLEY ONYX CO., Tryon, N. C. $100,000. M. I. Hartleson and M. B. Hendry.

INTERSTATE GRANITE CO., Charlotte, N. C. John H. Small, Law Bldg., and others.

CANADIAN PLASTER PRODUCTS, LTD., 436 Fifth Ave. W., Vancouver, B. C., Can. $10,000.

TYLER SAND CO., INC., Norfolk, Va. $50,000. D. F. Tyler, 716 East Charlotte St., and others.

BENEDICT STONE PRODUCTS CO., 122 S. Michigan Ave., Chicago, Ill. $250,000 preferred and 10,000 sh. n.p.v. common. To manufacture and deal in concrete products. John C. Hobson, George H. Redding and B. D. Landers.

WISCONSIN CONCRETE PIPE & CULVERT CO., Sheboygan, Wis. Van Der Vaart Brick & Supply Co., stockholders, incorporators.

# Legal Information for Operators

## Too Few Quarry Workers May Be Legal Negligence

An important point of the law is that an employer may be negligent in failing to supply a sufficient number of men to perform a particular kind of work.

For instance, in Hulsey v. Tower Grove Quarry & Construction Co., 30 S. W. (2d) 1018, it was disclosed that an employee in a rock quarry, while engaged in his regular duties, was carrying a large, heavy, and unwieldy rock through a narrow passageway. The floor of the passageway was covered with a wet, slippery, and slimy mixture. He fell and was severely injured while carrying the rock. The workman sued for damages, contending that the quarry owner negligently failed to exercise due care to furnish a sufficient number of men to do the work with reasonable safety. Also, that he, by the exercise of due care, could have known that the number of men so engaged was insufficient to do the work with reasonable safety, and that it was dangerous and not reasonably safe. The injured employee further pleaded that his employer negligently failed to exercise due care to furnish and maintain a reasonably safe place in which to work. Since the mud and slime resulted in the floor of the passageway being dangerous, the Court held the injured employee entitled to recover damages for the injury, stating the following important law:

"The master owes his servant the duty to furnish him reasonably safe and suitable appliances for doing his work, and when the work requires men to do it, the men engaged therein are classed as appliances; this implies that the master will employ a sufficient number of men to do the work required to be done with reasonable safety to the men engaged therein. It is the well-settled (and common sense) rule that 'negligence in the employment of an insufficient force (or number) of men for the work may be proved either by direct or by circumstantial evidence'."

---

## Subcontractor Entitled to Recover on Surety

Probably one of the most common legal questions presented sellers of nonmetallic-mineral products is whether or not a principal contractor's bond secures payment to materialmen for materials supplied and used by the principal contractor. The latest higher Court case involving this important point of the law is Johnson Co. v. Columbia Casualty Co., 133 So. 850.

In this case a contractor entered into a contract to construct a building and to guarantee the faithful performance of the contract, an indemnity bond was executed in favor of the owner.

The contract between the contractor and the owner carried the following specification:

"The contractor for the work will be required to give an acceptable corporate bond of suretyship in the standard form of the American Institute of Architects to the amount of one hundred (100%) per cent. of the contract price for the faithful performance of his agreement. . . . In addition thereto the said bond shall include provisions for the protection of subcontractors and those furnishing labor or materials or supplies to the contractor on this work."

Pursuant to this specification the contractor posted a bond with a surety, containing the following provision:

"Now therefore, the condition of this obligation is such that if the principal (contractor) shall faithfully perform the contract on his part, and satisfy all claims and demands incurred for the same, and shall fully indemnify and save harmless the owner from all cost and damage which he may suffer by reason of failure so to do, and shall fully reimburse and repay the owner all outlay and expense which the owner may incur in making good any such default, and shall pay all persons who have contracts directly with the principal for labor or materials, then this obligation shall be null and void; otherwise, it shall remain in full force and effect."

The principal contractor defaulted and a subcontractor sued the surety to recover payment for labor and materials. The surety contended that it was not liable under the bond to third persons, or subcontractors, since the state laws do not require principal contractors to furnish bonds for protection of persons other than the owner. It is interesting to observe that although the lower Court held the subcontractor not entitled to recover from the surety, the higher Court reversed this decision and in holding the surety liable, said:

"The Court below held that the bond was solely for the benefit of Bishop Barry (owner) and that Johnson Company could not recover thereon. We think this holding was erroneous. It is true that Johnson Company was not a formal party to the contract, and we have no statute authorizing or requiring provision for the protection of third parties in construction contracts other than for public works . . . but, in the absence of such a statute, there can be no valid objection to parties contracting for the protection of other parties. The contract under review shows clearly that the principals intended that all subcontractors who furnished labor or material thereon should be protected thereby, and its language is ample to convey that intention. . . . The record discloses that the bond was in the form prescribed by the American Institutes of Architects. . . . The very essence and purpose of these bonds is to save harmless the laborer, material man, and subcontractor, along with the main contractor, and, when so expressed, they should be interpreted to effect this purpose."

---

## Denied Patent on Form of Steel-Concrete Wall

It is well settled that a patent may be obtained for any new and useful invention. However, if a single previously issued patent discloses the identical invention, the later inventor can not obtain a patent. Moreover, if parts of the invention on which a patent is desired have been shown in different old patents the inventor must prove that his combination of the old elements produce improved results, or a patent will not be granted.

For illustration, in Armbruster, 47 F. (2d) 815, it was disclosed that a contractor filed an application for a patent for constructing concrete walls, which consists in erecting a row of standards which are of ordinary I-beam construction. The exterior surfaces of the I-beams are a part of the outside of the wall and are connected by longitudinal tie rods. The wall is formed by means of form boards which are clamped to the exterior faces of the flanges of the standards, and which thus make forms into which the concrete is poured. The wall, when completed, consists of monolithic blocks of cement separated by the standards, the flanges of which are flush with the surface of the wall.

The patent-office examiners found old patents, one of which disclosed standards of similar construction with form boards attached thereto by clasps and sliding bars, into which concrete is poured. It also discloses connecting rods placed in a diagonal fashion between the standards. Another old patent disclosed a construction of standards and longitudinal connecting rods. Another old patent showed mold boards held by clamps.

In view of these old patents the patent office refused to grant a patent. The contractor appealed to the Court, which also refused to allow a patent, saying:

"If the various elements which go to make up appellant's (contractor's) disclosure are found in the references, even though a part may be taken from one and another part from another, if no new and useful result is obtained and if there be no invention, the disclosure is anticipated. This has been held to be the law in process, as well as in device patents."

# Life of Wire Rope Often Depends on Proper Sizes of Sheaves*

THE effect of sheave diameter on the ultimate service received from operating ropes is often greatly underestimated by many rope users. This is a subject which should receive careful consideration, since not only is sheave diameter reflected in the rate of fatigue in the wires of the rope, but it is also reflected in the rate of wearing, or cutting, of the sheave grooves, which results in non-productive work and shortened service for the rope. A study of these two considerations will indicate the most economical sheave diameter from a standpoint of rope cost, as well as sheave cost and maintenance.

In this article we deal only with the fatigue of wire ropes when operating around sheaves.

It is of vital importance that sheave and drum diameters be set as large as possible in order that the most economical rope service can be obtained.

It is not possible, of course, to maintain the same ratio of sheave diameter to rope diameter for all classes of wire rope installations or to secure the same amount of work from a given size and construction of wire rope operating on these different installations. It is true that a difference in sheave diameter may be partially compensated by the use of another construction of rope, but such a step often means a sacrifice of other desirable and necessary qualities in the rope itself for the particular duty under consideration. In general, it is advisable to design sheave equipment so that the tread diameters are approximately in accordance with the average values given in Table I. By referring to Fig. 1 it will be seen that the tread diameter is measured at the bottom of the groove.

Standard practice has more or less set certain limits for sheave and drum sizes for certain classes of equipment. This would include elevators, dredges, derricks, cranes and excavating machinery. It will be found, however, that sheave and drum equipment is not standard and, in general, it can be stated that, where the more liberally designed equipment is used, better and more economical rope service will result. It will be recognized that, in many of the classes of service listed, the sheaves and drums are not as large as recommended in wire-rope catalogues.

Various factors contribute to this condition, among them the economical design of equipment. As a rule, however, the service secured under these conditions is satisfactory, but it should be borne in mind that any increase in sheave diameter will be reflected in additional rope service.

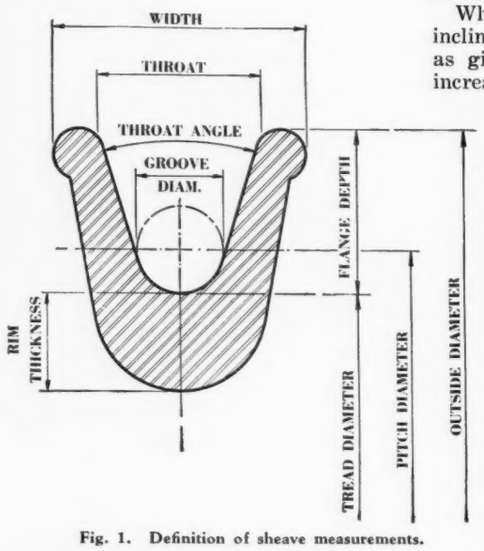



Fig. 1. Definition of sheave measurements.

It is generally advisable not to allow the tread diameter of sheaves and drums to be set at a lower value than those listed in Table II. A study of each individual installation will indicate the necessity for selecting certain sheave sizes and the feasibility of adhering to this selection.

When we consider shaft hoists and inclines, it is essential that the values as given in Table I be considerably increased in order that most economical service will result.

On large mine hoisting installations, using 6 by 19 rope, the head sheaves are sometimes set as high as 90 times the rope diameter. On installations of this type, it has been found that considerable fatiguing action takes place with sheaves of 72 times the rope diameter; also, that this action is materially reduced when the sheaves are increased to 80 times the rope diameter, and that the fatiguing action is practically eliminated when the sheaves are set at 90 times the rope diameter. These ratios of sheave diameter to rope diameter may also be applied to sheaves and drums for inclines where 6 by 19 rope is used. On such installations, using 6 by 7 rope, a ratio as high as 96 times the rope diameter should be used as a minimum.

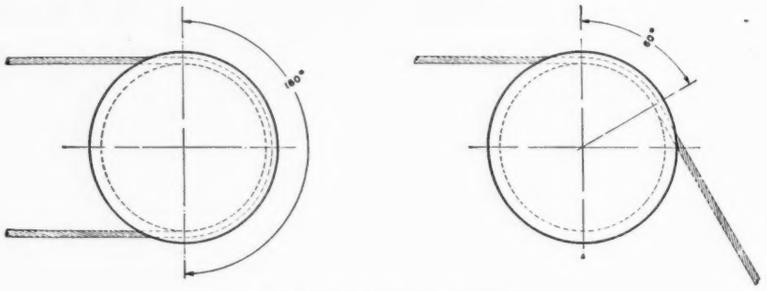



Fig. 2. Angle of rope departure.

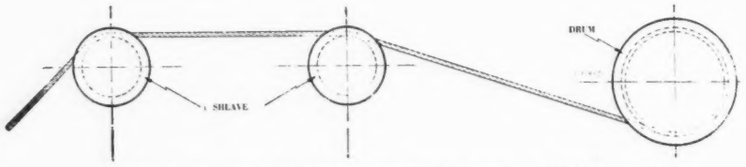



Fig. 3. Unnecessary changes in rope direction to be avoided if possible.

Fig. 3a. Reducing the number of changes in rope direction is desirable.

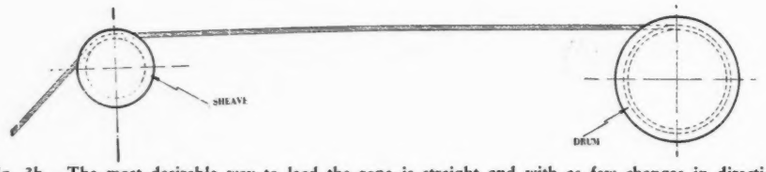



Fig. 3b. The most desirable way to lead the rope is straight and with as few changes in direction as possible.

*Reprinted from *Wire Engineering*, John A. Roebling's Sons Co.

Knuckle sheaves and curve sheaves on inclined haulages, or endless-rope haulages, must be treated as a different problem, as the design of such sheaves is closely associated with the study of groove wear and material for grooves.

In general, the angle of rope departure over a sheave has no bearing on the design of the sheave, except for sheaves in the knuckle class, where the angle is extremely small. The sheave diameter for either condition shown in Fig. 2 should be the same.

There are many other factors entering into the economical design of rope installations, such as factors of safety, rope speeds, number of sheaves around which the rope must operate, length of rope in use, and type and size of power unit.

To lead the rope with as few changes in direction as possible can be stated as a fundamental principle in the use of wire rope. Where many changes in direction are required, large sheaves must be employed for equivalent rope service when compared with installations having fewer changes in direction.

Fig. 1 illustrates an actual "set-up" to be found in some places, which if rearranged as indicated in Figs. 3a and 3b, would result in increased rope life.

Thus, it can be readily realized that with the many factors entering into the consideration of sheaves, it is a subject requiring very careful attention, if an economical balance in design of wire-rope equipment is to be obtained, and a satisfactory rope life secured. The engineering department of a wire-rope manufacturer can give material assistance in securing such a desired mechanical balance.

TABLE I.
AVERAGE DIAMETERS RECOMMENDED.

| | |
|---|---|
| For 6 by 7 rope, | 72 times rope diam. |
| For 6 by 19 rope, | 45 times rope diam. |
| For 6 by 37 rope, | 27 times rope diam. |
| For 8 by 19 rope, | 31 times rope diam. |

TABLE II.
MINIMUM DIAMETERS.

| | |
|---|---|
| For 6 by 7 rope, | 42 times rope diam. |
| For 6 by 19 rope, | 30 times rope diam. |
| For 6 by 37 rope, | 18 times rope diam. |
| For 8 by 19 rope, | 21 times rope diam. |

# The Geology and Widespread Use of Diatomite in Modern Industry

UNDER the name of diatomite, the tiny skeleton-like remains of microscopic water plants that floated in ancient oceans and lakes are now being made to serve mankind in numerous ways, says the U. S. Bureau of Mines. These small organisms, which have such interesting post-humous value, are found in all kinds of water, quiet or moving, hot or cold, and saline or fresh. Some of them move freely, others attach themselves to various objects, but all absorb mineral salts from the water in which they live. They make skeletons of silica out of this mineral matter in much the same fashion that oysters make shells out of lime taken from sea water. Diatoms multiply rapidly, but their life span is short. After they die the organic matter decomposes, and the skeletons sink to the bottom where they gradually build up deposits of diatomite. It is estimated that there may be as many as 50,000,000 individual skeletons in a cubic inch of diatomite, which may be millions of years old.

Common names for diatomite are: diatomaceous earth, tripoli, kieselguhr, and infusorial earth, although strictly speaking the last-named material is not diatomite, says Paul Hatmaker, in a report recently published by the Bureau of Mines.

More than ten thousand varieties of diatoms have been studied and classified. Among the more important are the Coscinodiscus which resembles a golf ball in appearance and the synedra which is long and needle-shaped. Circular, disk-like forms are common. Others are of every conceivable shape and size, but all are relatively tiny. Their geometrical designs are fanciful and intricate. They may be short or long, triangular, in the form of a half-moon, needle-like, disk-shaped, spherical or ladder-shaped; in fact the variations are almost infinite. Diatoms are unicellular, and are described as being like pill boxes, with two halves that fit upon each other snugly. They range in size from that of a pin's head to minute particles visible only with a microscope of high magnification.

Diatomite is widely distributed over the world. At present the United States has the largest commercial beds and leads in world production, with Algeria second. In the United States the most important commercial deposits are in California, although diatomite is produced in Washington, Oregon, Nevada, and some of the eastern states.

Diatomite has many important uses because of the wide adaptability of its extraordinary physical properties. It has rapidly assumed greater and greater importance in modern industry as markets are developed and industry becomes familiar with the various benefits to be derived from its use. One of the interesting features in respect to its marketing is that new uses continually are being found for diatomite which more than make up for the decrease in some of the older ones.

The more important uses are: First, as a filtration medium, second, as a heat insulation material; and third, as an admixture in concrete.

The cane-sugar industry at present is the largest consumer of diatomite, it being used mainly in filtering sugar solutions. Diatomite also is used to a certain extent in the beet sugar industry. Diatomite also may be used for filtering orange juice, lemon juice, and grape juice, vinegar, pectin, citric acid, glucose, lactose, maltose, molasses, syrups, cottonseed oil, corn oil, fish oil, castor oil, lard, used crank case oil, used transformer oil, petroleum, petroleum-water emulsions, beverages, antitoxins and serums, nitro-cellulose, dyestuffs, glycerine, alcoholic extracts, adhesives, various emulsions, sewage, liquid soaps and chemicals.

Owing to its extreme porosity and fineness of individual air chambers, diatomite in various forms is extensively used as insulating material. For insulating, diatomite may be used as sawed bricks which are cut from the rock in place at the quarry, as a granular powder, as bricks which are prepared with some bonding material and then calcined, or as mortars and cements. The bricks are used extensively for lining furnaces, in which they are usually placed behind a firebrick facing and are backed up by ordinary brick. Thus sandwiched in, they are very efficient in preventing heat losses.

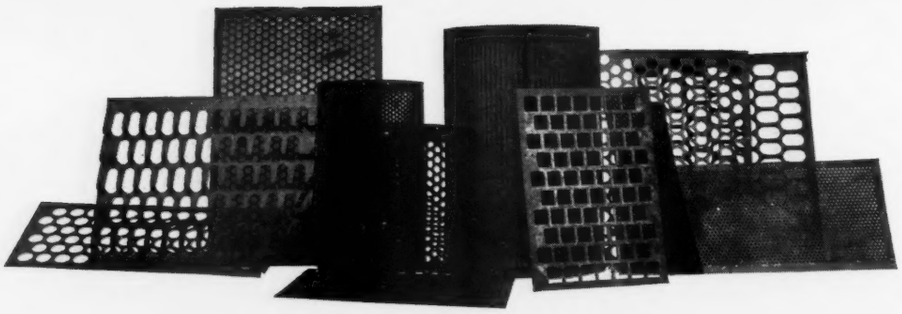
The use of diatomite as a filler for battery boxes has increased rapidly in the last few years. The annual tonnage now so employed is considerable, and this market is one of the most important of the newer outlets which are being developed.

Diatomite is used as an absorbent in the manufacture of acetylene gas. It is used also for absorbing chemicals such as bromine, alcohol, and acids, for liquid fuels, liquid manures, and disinfectants. It makes a good packing material for strong acids such as nitric and sulphuric acids because in case of breakage it tends to absorb the spilled acid.

Diatomite is used as a source of silica for ultramarine blue, and in the wet process of manufacturing water glass. It is used as a carrier for catalysts in the hydrogenation of oils for the manufacture of soaps. Diatomite also is said to possess certain bleaching qualities.

In structural work, besides its use in concrete, diatomite is used in the manufacture of roofing tiles and for certain building blocks and bricks where light weight is desired. It may be used for soundproofing rooms and telephone booths, and fireproofing safes and storage vaults.

Because diatomite when finely pulverized yields minute particles which still retain angular characteristics, even though the individual diatoms may become broken, it is widely used as an abrasive for polishing. Where metal surfaces are required to take a high luster, the desired effect or polish is had by making minute microscopic scratches on the metal which in turn reflect light. Pulverized diatomite, mixed with other ingredients, makes an ideal material for this purpose.



# For Best Results Use the Morrow!

THE Morrow Perforated Metal Screens for sizing and preparing coal, sand, gravel, stone, and other bulk materials are made by a company specializing in screening machinery.

Behind our recommendations to you lies years of experience which has taught us the best line of screens to use for a given work.

You are offered such sizes and shapes of perforations which we know to be best suited to the screening of bulk materials.

If our wide stock does not suit your particular purpose, we will make special plates to your specifications. Our factory is equipped to roll or flange plates to order, and will punch marginal holes as directed.

*Write for full particulars*

THE MORROW MFG. CO. QUALITY MORROW SERVICE WELLSTON - OHIO

---

ORDER IT FROM YOUR J&L WAREHOUSE AND BE SURE

J&L WAREHOUSES

CHICAGO CINCINNATI
DETROIT NEW ORLEANS
PITTSBURGH

**Louisville**—Stock of Bars for Concrete Reinforcement and Bar Fabricating Yard.

**Memphis**—Distributing Warehouse for Pipe, Sheets, Spikes and Wire Products, Reinforcing Bar Warehouse and Fabricating Shop.

JONES & LAUGHLIN STEEL CORPORATION
AMERICAN IRON AND STEEL WORKS
PITTSBURGH PENNSYLVANIA

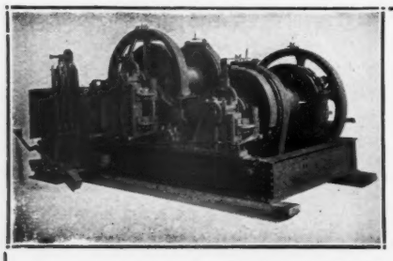
---

Lewistown Foundry Products
ARE
**Performance-Tested**

BUCKET ELEVATORS
REVOLVING SCREENS
CRUSHERS DRY PANS

Lewistown Foundry & Machine Co.
Lewistown, Pa.

---



**STREET**

SLACKLINE HOISTS ARE KNOWN FOR DEPENDABILITY AND EASE OF OPERATION. THEY ARE BUILT WITH JUST AN ADDED TOUCH OF TOMORROW.

*ASK FOR BULLETIN*

HOISTS DERRICKS CABLEWAYS SLACKLINE EXCAVATORS

**STREET BROS. MACHINE WORKS**
Incorporated
CHATTANOOGA, TENN.

---

SIMPLICITY DEPENDABLE COLD MIX ASPHALT PLANTS FOR QUARRIES

THE SIMPLICITY SYSTEM COMPANY
CHATTANOOGA, TENNESSEE

Omit Booster Pumps
Where the discharge of a dredge is at a distant point, the Hydroseal Pump can introduce immediate direct economies. The unique principles it embodies enable it to pump against any pressure up to 150 pounds and to maintain this initial discharge head, with high efficiencies, for an indefinite period, thus making it unnecessary to use booster pumps. The saving in an installation such as that pictured would be $5.00 per man per shift or $10.00 labor expense per day per pump. This is a daily labor saving of $20.00, or $6,000.00 per year. The initial cost of the Hydroseal Pump is thus saved in a few months, for aside from labor, there is a tremendous power economy and a reduction of maintenance to a fraction, due to the Hydrosealing of the side surfaces of the pump impeller from the abrasive water being pumped. Write for our Catalog No. 331 and a list of the concerns in your vicinity who use the Hydroseal Pump. The Allen-Sherman-Hoff Co., 215 South 15th Street, Philadelphia. Offices in Principal Cities.
HYDRO SEAL